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REGULARS

- **Data Statements** 6
 Keeps up to date with what's going on in the
 Commodore world
- **Communications Corner** 13
 How much is your hobby costing you - David
 Jarda has been finding out
- **Competition** 16
 A chance to win your own copy of Datel's
 Action Replay MK IV cartridge
- **Games Update** 26
 A handy compilation of new releases



Pool Games



Blast Off

- **Bothersome Basic** 37
- **Teacher's Pet** 45
 Keep up to date with educational utilities
- **The ICPU/G Column** 56
- **First Steps** 63
 The first part of a new series explaining the
 basics of programming
- **Making Music** 75
 Continuing our series this month we look at
 ring modulation, synchronisation and
 filtering
- **Software for Sale** 80
- **Listings** 82
 How to type in the programs
- **Back Page** 88

	64	64C	64D	64E
Data Statements	•	•	•	•
Communications Corner	•	•	•	•
Competition	•	•		
Games Update	•	•		
Bothersome Basic				
Teacher's Pet	•	•	•	•
The ICPU/G Column	•	•	•	•
First Steps	•	•	•	•
Making Music	•	•		
Software for Sale	•	•		
Listings	•			
Back Page	•	•	•	•

FEATURES

- *Ultimate Cartridges* 18
A look at the Final Cartridge III and the Action Replay MK IV
- *Commodore Modem Revealed* 39
How to write software for your modem
- *Artificial Intelligence* 58
One step beyond for the humble micro?
- *Sonus MIDI Music Programs* 65
A look at the music programs Sonus has to offer
- *CP/M Assembly* 70
A look at what the CP/M + operating system can do

UTILITIES

- *The Big Blue Reader* 10
Stretch the versatility of the 1571 disk drive with this useful program
- *Auto-Start Maker* 22
Fed up with waiting for programs to load - then this useful utility is for you
- *Clear with Basic* 24
Variety is the name of the game in this utility which enables you to clear your text screen
- *Tabulate* 30
A handy Basic subroutine for your numerical printouts
- *Making GEDS British* 47
Fed up with this program written by Americans and aimed at Americans - well now us Brits have a way of converting it
- *Gyrospend* 69
- *Extended Backgrounds* 69
A handy program which allows text to have a background colour for each of the 25 screen lines

	DS	DS	DS	DS
• Ultimate Cartridges	●		●	
• Commodore Modem Revealed	●		●	
• Artificial Intelligence	●	●	●	●
• Sonus MIDI Music Programs	●		●	
• CP/M Assembly			●	
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• The Big Blue Reader			●	
• Auto-Start Maker			●	
• Clear with Basic	●		●	
• Tabulate	●		●	
• Making GEDS British	●		●	
• Gyrospend	●		●	
• Extended Backgrounds	●		●	

ARGUS
PRESS
GROUP

VOLUME 4
NUMBER 7

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DATA STATEMENTS

Reverse Logic

To celebrate Australia's Bicentennial Year, the Aussie companies were out in force at the recent Which Computer? Show, Etkes and tinnies gave way to floppies and PCs on the Astrade stand.

Despite a loyal and vociferous readership for Four Computer in the Antipodes, Commodore compatible peripherals and software were not in evidence. The Australian Trade Commission were eager to promote the fact that high technology is no stranger to the shores of Oz.

Coming from Down Under it's not surprising that one product from Software Solutions, the QCOM Corporate Retriever, is based on an inverted file technique!

The Communist Threat

Microsoft are agents to a Communist plot to take over your computer. The release of *Tetris*, the first computer game ever to be produced in Russia and marketed in the West, has caused quite a stir in the media, particularly in the USA.

At the recent launch members of Microsoft, the Russian Embassy and America's CBS News mingled together in a glamorous atmosphere at Virgin Games' Oxford Street store. President Western standards ensured that copious quantities of champagne were so hand (such a bottle or two anyway) so that *Tetris* could be launched in the true spirit of technological exchange. A statement on the USA Government's desire to send in a team to verify software sales quotas has not yet been cleared for publication.

Tetris was invented by Alexei Pajitnov, 30, and the man who provided to Microsoft was Victor Bogdanov, Head of the Computer Centre of the USSR Academy of Sciences.

The game was first spotted by Andromeda Software's Robert Stein at the Computer Research Laboratory in Budapest during a recent visit to Hungary. Impressed by the simple addictiveness of the game, Stein

Sticking to Wales

Komis, the Speed King joystick company, have moved from their original home in Troedgar, Gwent, to larger premises but they are still staying in Wales.

The new factory at Ebbw Vale was opened by the Rt Hon Secretary of State for Wales, Peter Walker, in the presence of the Rt Hon Michael Foot, MP for Blaenau Gwent and other leaders and dignitaries including the Mayor of Blaenau Gwent.

Komis currently export 90% of their joysticks and have just signed an agreement with Kraft, one of the largest computer peripheral manufacturers in the US, for the distribution rights to their products in Europe.

The move to the larger premises will enable Komis to employ a further

100 people which is a welcome move for the people of South Wales.

At the opening, Peter Walker enthused, "I am delighted that this company with such high technology has conquered world markets, applying up to date technology coupled with an enthusiastic labour force. I'm sure the company will have enormous impact worldwide in years to come." Speaking on behalf of his constituency, Michael Foot added, "I'm thrilled to see what has happened here for Komis and feel sure the company has a wonderful future, which is good news for all of us."

Teachline:

Komis Products Ltd 21 Percuss Industrial Estate, Ebbw Vale, Gwent NP23 5SR. Tel: 0493 356767.



Hyatt Matthews (left), Komis chairman, explains the finer points of the Speed King to Peter Walker and Michael Foot.

showed it to Microsoft who immediately snapped up the publishing rights.

The game is an enhanced form of the original PC game programmed by Vadim Gerasimov of Moscow University. In addition to a high resolution backdrop, the 25 minute musical accompaniment was

programmed in by Hagar, a regular contributor to Computer's growing bank of musical talent.

Teachline:

Microsoft Ltd Athlon House, 66-72 Shoe Lane, London EC4A 3DF. Tel: 01-377 4543.

D A T A S T A T E M E N T S

Barrett's New Home

The vacancy at Commodore for a marketing manager, arising through the resignation of Amanda Cridge, has been filled by the appointment of Dean Barrett. Barrett was previously employed by PR consultants Burgess Dunning Dawson on their Commodore account. Naturally this placed Barrett in an ideal position to move across to his new post.

Commodore's managing director, Steve Franklin, comments, "Dean has proved himself over the past six months, handling our account at BDD not just as a professional PR man but as a valuable member of my sales and marketing team. He knows the business, he knows our dealers and he knows our agencies. I am delighted to welcome him aboard."

Barrett will be responsible for developing dealer and end-user marketing support across both the consumer and the business divisions. He will also co-ordinate the activities of Commodore's agencies: Mills & Hughes (consumer product advertising), Shape (business product advertising) and his old company BDD (corporate and product public relations).

Teachline:

Commodore Business Machines UK Ltd, Commodore House, 7th Sturrahurst, Gardner Road, Maitland, Berks SL8 7JA. Tel: 0492 77000.

GEOS Basic

Working with standard GEOS is easy but programming can be a problem unless you use BeckerBASIC from Mainz.

This extension language adds over 270 new commands and functions to the C64 and GEOS, allowing programmers to use pull-down menus, dialog boxes, various fonts, high resolution graphics and fill patterns. Special commands are included for screen and cursor control, sprite animation, sound and music development with structured programming aids.

A further enhancement is customising through user defined commands and function key defining.

Once the utilities have been utilised, they can be distributed to other users through a routine facility. BeckerBASIC is compatible with C64 Basic and GEOS Version 1.1.

Video Nasties

Accutone have produced a trendy roller blind to combat ailments associated with protracted exposure to monitor screens.

The Blind can be rolled away to facilitate cleaning of the screen but, when in position, it helps to keep the operator clean too!

It takes around 30,000 volts to form a Static produced by the screen, creates a colour image on the screen and this produces a positive electrostatic field. The human body is negatively charged so an attraction is set up (you can see this on a Saturday afternoon when the football results are on TV - dozens of humans smack to the windows of TV rental shops).

Controlled along on this flow is all of

the positively charged dust and grime, especially cigarette smoke, which is attracted to your negative charge.

To combat this effect the new screen filters are varnished to reduce the static present when the monitor is in use. Other problems are cured by the new filters such as bracketing-rising glare and harmful emissions are reduced by a metallised mesh.

The shock caused by static build-up is nothing compared to the shock caused by the price - £14.50 to £34.50!

Teachline:

Accutone, Napier Way, London Road, Wokingham, Wokingham, RG40 7NS. Tel: 0732 865335.



Commodore's smooth snafu

Tragic Loss

An accident has robbed Code Masters of a talented graphic artist and close friend. James Wilson, 20, was tragically drowned in an accident at Lyme Regis, Dorset, on Thursday, January 14th.

Wilson was a major contributor to the success of many Code Masters titles through his imaginative graphics. In a joint statement, the Darling brothers expressed their

sorrow at the loss of their life long friend. "Not only was James a professional and innovative contributor to our company but, more importantly, he was a very special friend to all the family - we shall miss him tremendously."

Your Commodore would also like to express their deepest sympathy to James' family and all who knew him.

DATA STATEMENTS

Code Masters' Stimulator

"Over a hundred freelance programmers take a lot of organising", according to Code Masters' David Darling. With an increased output in 16-bit products for the Amiga and Atari ST alongside the new Code Masters Plus range, the need for a full-time publisher's assistant has become essential and the Darling's didn't have to look far for someone to take on the task. Mark Ballock, programmer of Frost Machine Simulator, has been given this demanding job.

Ballock has to listen to the problems and excuses of the commissioned programmers so his past experience should mean that he's well equipped to crack the whip or give encouragement, when necessary.

Only one question remains; will the new blood in the Code Masters camp mean that they'll drop their habit of calling almost every game something or other Simulator?

Timeline:

Code Masters: 1 Rossmore Business Centre, Rossmore close, Banbury, Oxon OX15 2RT.

Protect the Innocent

School students as young as 11 are being encouraged to consider the implications of the widespread use of databases. British Trades Alphabet study cards have been distributed to schools and colleges throughout the United Kingdom to increase awareness of the Data Protection Act 1984.

In a statement on this latest move, Eric Howe, Data Protection Registrar, said recently, "It is important that young people are made aware of their rights under the Act. It is also useful if they are familiar with the legal obligations of computer users. With information technology playing an increasingly important role in our daily lives, it is inevitable that a large percentage of students will be working with computers during their careers and certainly their own personal data will end up in many data banks."

The release of over 30,000 of the study cards comes as a response to a growing number of enquiries for information on the Act from students

Colour Matrices

The competition between colour dot matrix printers is heating up with the launch of machines from Star and Citizen.

The Star Multicolor LC-18C has a built-in Commodore interface and allows a choice of seven colour, high density NLQ printing in one of eight fonts. The paper can be sheet fed or raster driven by a push feed system which means raster label and standard form printing. Switching between raster and sheet feeding is facilitated by a parking system which pulls the raster paper out of the platen path but allows for automatic replacing after the sheet run is completed.

The new style Star front panel allows direct selecting of six of the special NLQ fonts as well as the normal linefeed, page feed, line dump, self test and power up functions as well as the new paper parking facility.

The Citizen HQ-P40 also employs high density NLQ facilities to support its optional seven colour printing capabilities. Only one font is supplied in the standard machine but this will be extended by the use of extra plug-in

fonts giving a wide ranging capability for future developments.

The basic printer costs \$499, excluding VAT, and the add-on colour printing unit adds an extra £50 to this. There are no plans for a Commodore interface but a Centronics connection enables access through a suitable Commodore interface.

Both machines open up the possibilities of colourful graphs and pie charts as well as high resolution screen dumps through a suitable control program.

For those with more modest requirements, Epson's LQ580 lacks the colour facility but does provide font expansion through a series of cards for £385 plus VAT.

Timeline:

Star Multicolor LW Ltd: Crown House, 20 Uxbridge Road, Ealing, London W5 2RS. Tel: 01-878 2238.

Citizen Europe Ltd: Tel: 0885 72622.
Epson (UK) Ltd: Epsford House, 55A High Road, Hemel Hempstead, Herts AL9 8JH. Tel: 09-602 8992.



Citizen HQ-P40 colour printer

and teachers up and down the country. The cards give a brief information about the Act but their main purpose is to instigate discussions and create a questioning attitude towards the way in which databases can be used and the rights which an individual should have to gain access to files held about themselves.

Further information can be obtained from Nigel Watson, the Assistant Data Protection Registrar.

Timeline:

Office of Data Protection: Springfield House, Water Lane, Wotton, Chichester W9 3AT. Tel: 0623 33773.

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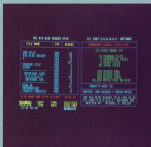
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THE BIG BLUE READER



Big Blue's system screen.

The 1571 disk drive can imitate CP/M drives but its versatility can be stretched even further

By Norman Doyle

As a journalist I'm often asked to supply articles on MS-DOS IBM format disks. This has meant using an IBM compatible running a wordprocessor which has different commands to the one that I normally use. Now, with the Big Blue Reader, I can do all my work on the C128D and create an MS-DOS disk using the integral 1571 drive and my customary wordprocessor.

The Big Blue Reader from SOGWAP Inc has been around for a couple of years but was not fully available in Britain. The early version had a few drawbacks with disks having

to be pre-formatted using a separate program before the Reader was loaded and the program was unable to operate with CP/M program disks. The new CP/M version corrects these failings and adds a few extra improvements into the bargain.

The resultant program is a powerful aid to anyone who has to cross formats, allowing transfer of files between Commodore DOS, eight sector or nine sector MS-DOS and C128 CP/M diskettes in either single or double sided formats.

Full use is made of the C128's memory as a buffer to allow multiple

file transfers and disks can be formatted to Commodore or MS-DOS specifications without having to resort to secondary programs. Add to this the simple, user-friendly menu system and the result is a powerful program with many applications.

Commands are kept to just eight, allowing any facility to be called up at the touch of a function key or by highlighting one of the menu options using the cursor keys: Load Dir, Copy, Type, Utilities, View Dir, Tune, Date and Disk Create.

Load Dir

Selection of this option is met with a secondary disk type menu - Commodore, MS-DOS or C128 CP/M. If the computer finds a correctly formatted disk in the drive the menu can be scrolled back and forth using the cursor keys.

This is a preparatory function which must be called before selecting either the Copy or Type options.

Copy

If a directory has been loaded into the program, any number of files can be selected for copying by using the cursor keys to scroll up or down and the RETURN key to make the choice. Selected files are indicated by a reversed asterisk beside the file name and mistakes can be corrected by restoring any of those highlighted file names.

If all the files are to be copied the F1 key doubles as a 'select all' key and the F1 key will cancel all selections.

Before the transfer is made, the program asks which of the three formats is to be used for the target disk. If this means a cross over from say, Commodore to MS-DOS, the option to convert from Commodore ASCII to standard ASCII codes is offered.

Type

Any file can be displayed directly to the printer on screen but the results cannot be guaranteed. Sequential text files can be displayed without problems in standard or Commodore ASCII characters but program files can corrupt the meaning of the program.

Text files normally contain acceptable alphanumeric characters but when I tried Commodore program files the results were influenced by some of the codes contained. Colours changed, windows were formed and program crashes resulted.

There are two ways around this difficulty. The disk contains an examine file utility which can load a file for display on the C128's monitor. There is also a handy documented User Translation Table in the Utility option which should strip non-printable characters from displayed files but my attempts to use it proved fruitless.

Utilities

There are two utility functions held on the F1/F8 key. The main one offers three options. The first I have just mentioned, the User Translation Table. The MS-DOS diskette formatter is essential and it's good to see it inside the program at last instead of as a separate file. Unfortunately, the newly added CP/M formatter is still a separate program.

The final option is a 1571 Speed-Up which disables the write verification which normally takes place when saving to a Commodore diskette. Although this gives about 30% faster saving times and is fairly reliable, there is the possibility of failure and it only applies to Commodore and CP/M transfers.

The second utility is a standard Commodore DOS allowing C128 disk commands to be easily issued to the drive.

Additional Keys

Before transferring a file it may be desirable to check what is already available. This could be done through the Disk Command option but a second, separate option is included which also allows the reading of directories from all disk formats.

Time and date options also exist which will label MS-DOS disks or simply give a temporary screen display.

Conclusions

As a 'one of a kind' program there is no yardstick by which to gauge the Big Blue Reader's performance. All that can be said is that it does its job admirably well with as little fuss as possible. The functions are basic and I got the feeling that the facilities have been stretched to eight options to comply with the number of function keys available.

The program is definitely for those who have a very specialised need such as its own or for those who are currently upgrading files to a newly acquired IBM compatible system.

Devised for a 1571 drive, the program will only run on a 1280 in Britain which limits its availability to many users. To those with access to a 1280 or to the very rare 1571 standard drive, this utility is an absolute boon and, knowing the capabilities of the excellent 1571, more Commodore programs may become available from the States in the near future. %

Tweaking

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Communications Corner

Is your hobby as costly as you think? Our intrepid reporter in the world of communications has been finding out

By David Janda

As a area of concern that is rarely mentioned when buying communications equipment, be it modem, software or a subscription is the actual charge to your telephone bill as a result of your new found hobby. On the one hand it would be unfair to suggest the subscription to give you an accurate estimate of how much you will be using that equipment or services, yet on the other hand some of the average figures I have heard quoted to potential customers are ludicrous!

There are three to four areas in which you will have to pay out such as purchasing equipment, cost of phone calls, subscription to on-line services (if applicable) and payment for sub-scribed services (on-line charges etc.)

Before I describe each aspect, I would like to point out that one of the main reasons traps the hobbyist into not budgeting for their hobby. Of course costs can be offset over a period of time, but you'll have to pay up in the end, so be prepared!

Purchasing Equipment

This covers the modem and software. The first payout can be the most crucial of three. Purchasing a model will affect the time spent on-line, and the use of bad communications software will bog you down. There is nothing worse than flipping through dozens of menus while on-line and the telephone meter is ticking. As far as choosing a modem is concerned I would recommend that you purchase one of the more expensive models! Why? Because these

provide higher baud rates such as 1200/75 and 1200/1200 full duplex even 2400/2400 full duplex such as the Pace Series Four 2400S (£499 + VAT). Higher baud rates means more data going down) and up) the phone line per second, and this will reduce the overall time spent on the telephone.

Communications comes in many guises. The only advice that can be offered is to choose a package that you feel comfortable with. You can save money in the long run by purchasing software that provides some sort of data log in the case of window systems, frame capture to disk or memory. This will enable you to read the captured material off-line thus saving you money.

It is also worth noting that the commercial services such as Microsoft and Compaq offer subscription various 'packages' which tend to include the modem, software and subscription all at a reduced rate, which are worth checking out.

One hidden hardware cost that may crop up is that of a telephone extension, or even a new line into your premises. Should you really get into communications the family may get annoyed with all your wires trailing across the living room floor and you may be hindered to some corner of the house. A telephone extension may be in-order, and here again you can save money by purchasing approved DIY telephone extension kits from reputable companies such as Dataphone Ltd for as little as £10. BT will organise it for a minimum of £28.75 + VAT for residential customers.

Should you use the phone frequently then you may have to opt for another line into your premises. The initial cost will be £85 + VAT. Then there is the cost of the phone (always buy your own - never rent one from BT), and the quarterly rental is £11.85 + VAT.

Cost of Phone Calls

This is the big one! I have met so many people, who, after some time have taken one look at the phone bill and have subsequently parked their modem in the attic for good! Without a doubt your phone bill will go up - be prepared for it to double or even triple. This may not be as bad as it sounds. An average quarterly phone bill of say £25 (ex. rental and VAT) going up to £60 may seem a lot, but is £60 such a big deal? Well, to some it is, so again it is best to be prepared. The telephone subscriber has two vital weapons of use in this regard: the BT phone bill a free booklet from BT and phone directory!

The cost of a call is measured in metered units. One unit costs 4.4p + VAT totalling 5.06p - remember this figure, it is vital! Depending on what time of day you call, and what distance that call is at you will be allowed a fixed amount of time for each unit. There is a simple formula to remember:

Number of units x 5.06p = cost of call

As an example, I live in north London and wish to make a call to Basildon, Essex at 9pm on a weekday.

The call will be cheap (non-Fri Spanish number?). Now I need to know what charge band facilities fall in, so looking at my A - D telephone directory I see that the charge band letter is 'A'. A cheap rate call is charge band 'A' will give me 100 seconds per metered unit. I make and time the call which lasts 423 seconds and divide this by 100 which gives me 4.23. Ah! We have come across a fraction, but all calls are rounded up to the nearest unit so I get a figure of 5. This is the number of metered units used for the call. Using the formula mentioned earlier:

$$5 \times 5.66p = 28.3p \text{ the cost of the call}$$

Each and every call that I make is calculated in this way. After a while it becomes second nature. The total cost of the call is written down (rounded up to the nearest penny) and at the end of the day a total is made which I enter into a book. At the end of a week the daily totals are added up and an appropriate number of telephone stamps are purchased. When the next BT bill arrives you simply pay at the local Post Office.

The calculating, and noting down of totals is an application logging to be computerised.

Subscriptions

Subscribing to services such as Microsoft, Compuart or Microlink is going to cost you money. The vast majority of services have a quarterly subscription and nearly all require you to subscribe for a minimum of one year.

Value Added Services

This is another of those costs which most often than not is not budgeted for. Under the heading can come line charges, cost of downloading telesoftware, playing an on-line adventure game, entering a programme, or time charges for reading pages of information. These can mount up, and are very hard to keep track of. Compuart provide their customers with a detailed invoice itemising every transaction made on the system together with reference number, description, cost, date and VAT. Hang off to Compuart!

Print/Microsoft on the other hand are terrible in this department. Bills are not itemised and there is no way in which you can verify costs by

looking at the bill. It's a bit like receiving a bill in a restaurant which has just one heading - food & pounds please.

An example of where things can get out of hand is when playing Shades, Microsoft's on-line adventure game. This, like many other on-line adventure games is very addictive, and players spend a lot of time and money on it. The game is time charged, yet players can only check the total cost of the current session on-line, and even this does not include VAT. To make matters worse, even on Microsoft such as Xira the on-line magazine are time charged for non-Microsoft subscribers, yet the time charge is included in the current total for the on-line session (which is subsequently taken off when the bill is calculated). This makes a mockery of the on-line total, and in all the billing systems employed by Protonix, to get it mildly, puzzling.

By careful use of on-line systems, and by calculating the cost of phone calls a lot of money can be saved. It has not been my intention to "scare off" potential, or existing, modem users, but to highlight some of the cost which in the end, you and I have to pay. ☺

LIFESAVERS 0	C64	LIST PAUSE	1/1
<p>The C64 is sadly lacking a pause function that allows you to stop the listing of any program by pressing a certain key. This routine changes the LIST vectors to point to a new routine. This routine will then check whether a SHIFT, COMMODORE or CTRL key has been hit. If so the routine will loop around until the key is released. Thus stopping the listing.</p> <p>Once the key is released the LIST will continue as normal.</p> <p>A convenient way of stopping the listing for some time is to press the SHIFT LOCK key.</p> <p>By G. Saunders</p>		<pre> 10 REM ***** 20 REM LIST PAUSE 30 REM ***** 40 BL=1:LN=110:SA=49152 50 FOR L=0 TO BL:GX=0:FOR D=0 T 0 15:READ A:GX=GX+A:POKE SA+L* 4+D,A:NEXT D 60 READ A:IF A>GX THENPRINT"ER ROR IN LINE":LN=(L*10):STOP 70 NEXT L:END 80 DATA 162,11,160,193,143,6,3, 140,7,3,96,72,136,72,152,72,142 8 90 DATA 174,141,2,224,1,176,349 ,104,168,104,170,104,76,26,167, 0,1896 100 SYS 49152: REM START PROG </pre>	



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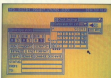
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ULTIMATE



Are the latest cartridges on the market the ultimate in C64 add-ons?

By Stuart Cooke

Even though the C64 has always had a cartridge port, it is only over the last couple of years that the cartridge market has been getting the attention that it deserves. Unfortunately, for the software industry, many of the cartridges developed were designed to enable the user to copy commercial programs.

As time has marched on, more and more cartridges have been developed, each offering more facilities than the last. Now Datal has added two more cartridges to the ranks of ever ready programs in the guise of the Final Cartridge III and the Action Replay MK IV. Both of these cartridges offer their owner facilities for making copies of commercial software. However, both offer the user of these cartridges many more features, making them stand out from others in the market.



Final Cartridge III

Action Replay MK IV



To Copy Or Not To Copy

Even though many cartridges offer 'backup' facilities no man stress that *Four Commodore* does not condone the copying of software for purposes other than the owners own use. We do understand the importance of having backups of much used software to guard against accidents. Cartridges that offer copying facilities should be used for just this purpose.

Making backups of programs can also give an increase in loading time. Using the *Warp 25* option of the *Action Replay IV* cartridge, more of this later, the loading time of my wordprocessor was reduced from 1 minute 40 seconds to just 9, yes 9, seconds, impressive eh?

The Final Cartridge?

When the original Final Cartridge made its way on to the UK market it proved to be immensely popular. Originally the cartridge added numerous 'utility' functions to the C64, such that the computer was in need of. DCS functions were added allowing the user to access a directory listing without having to LOAD it over the program in memory. Basic programmers were given a number of useful commands including a monitor, while machine code users were given access to a monitor that wasn't resident in the computers memory. The Final Cartridge III offers all of the above facilities and much more. For a start the C64 is given a new, Macintosh like, desktop. Pull down menus, windows and icons giving the computer owner access to many facilities via the keyboard, mouse or joystick.

Upon power up the desktop is

CARTRIDGES?

automatically entered, C128 users don't panic, just press the computer's reset button and you will be in C128 mode, though I found I had to take out the cartridge in order to use 80-column mode. The disk top offers various menus. I will deal with each one in turn. First of all you are given the chance to use what version of cartridge you are using, and the authors name - all standing stuff!

The second pull down menu, SYSTEM, is where we start to access the cartridge proper. This menu allows you to set up the mode that you are using the cartridge in. Choosing Basic drops the user back into C64 Basic, with new functions added. FINAL KILL disables the cartridge. FREEZER access the program manipulation menu which will be dealt with in a moment. The next option REDRAW does just that, it redraws the screen so that all of the windows that are open can be seen.

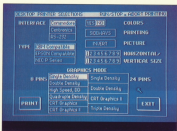
The third pull down menu, SYSTEM, indicates that update software will be released for the cartridge. CLUNK and TLINK are detailed in the manual as standing future extensions from disk or tape. A further option NOTEPAD, gives the user access to a notepad where you can store notes and create small documents. Facilities to alter print style, line spacing, print the text and save and load documents exist.

The UTILITIES menu gives the user of the cartridge access to some of, in my mind, more useful functions of the desktop. PREFERENCES allows you to change such things as the speed of the cursor, the screen and cursor colour, which port the input device is in and whether you are using a mouse or joystick. BASIC PREFERENCES allows you to set up a number of default parameters that are used when the programmer access Basic. Facilities available are:

Turning on/off a keyboard check;
Make all of the keys auto-repeat;
Make the cursor blink, or be steady;
Set up a default device for LOAD and SAVE operations;
Set the border colour;

Give C128 users access to the numeric keypad in C64 mode.

What I feel is missing from both of the above options is the ability to save your own personal defaults on disk or tape so that you can set up the computer as you like it very quickly. At the moment you have to alter the settings yourself every time you power up.



Choosing the CALCULATOR option gives you, yes you've guessed it, a calculator. Once this is on the screen you can either move the pointer to the keys that you want to press or use the keyboard. C128 users have an advantage here as they can use the numeric keypad.

The TAPE option allows you to LOAD a program from tape. Options are given to LOAD with a normal program or one that has been SAVED using the cartridge's tape turbo.

Disk users are well catered for with the DISK options. Here the user has the ability to perform any of the following: Change a program's name; Load and RUN a program;

Alter the name of a disk;
Fast Format a disk;
Empty a disk by just giving a new disk name;
Initiate a disk;
Validate a disk;
Scratch a program;
View a disk directory.

The directory option is quite unique as it allows you to display the contents of up to three different disks on screen at any time.

I must admit to finding use of the disk menu a little long winded. To access any command you need to perform the following:
1) If accessing a program highlight it on the directory.



- 2) Select the operation that you require.
- 3) Input any text required, such as new name, etc.
- 4) Select the ISO option to start the command.

A newcomer to Commodore computers may find this great, personally I felt that I could enter the necessary commands quicker at the keyboard.

The last desktop option is CLOCK. This allows you to set up the time and set an alarm. The time can be displayed at the top right of the desktop bar.

Basic Plus

As previously mentioned, the Final Cartridge III adds a number of extra facilities to Basic, these are:

- Bi-directional scrolling of Basic programs;
- A printer interface;
- Screen dump facilities;
- A disk and tape turbo;
- Pull down menus;
- 29 new commands;
- New editing commands.

The new editing commands allow you to jump to the bottom of the screen, delete characters after the cursor to the end of the line and freeze output to the screen - useful with the LIST command.

The printer interface mentioned above allows you to connect a non-Commodore printer to the C64 via a Centronics interface.

All of the new Basic commands can either be entered directly from the keyboard or selected from a pull down menu. Obviously space won't allow me to detail all of the commands available so I'll just mention a few: AUTO - gives auto line numbering facilities;

BAR - allows you to turn on and off the pull down menu;

APPEND/APPEND - adds the specified program to the one in memory from either tape or disk;

DESKTOP - takes you into the cartridge desktop;

DISK - allows you to send commands to the disk drive, and get directory listings, with ease;

DUMP - list variables used by a program;

FIND - search program for specified information;

KILL - disable the cartridge;

MON - enter the cartridge monitor;

RENUM - renumber a program;

PACK/UNPACK - compress and

uncompress the program in memory. I - allows you to use a hexadecimal number

Printer

As I have already mentioned the Final Cartridge III allows you to make backup copies of programs, - well this is the section of the product that does it, however, it doesn't end there.

Once you have accessed the Printer you can manipulate the program in a variety of different ways. Firstly, there is an extremely powerful printer dump option that will send a copy of your current screen to the printer. One extremely impressive feature of this screen dump is the fact that not only is the backup sent to the printer but sprites are also printed. This is the only printer dump that I have come across that does this. It is worth pointing out that due to the complexity of some programs you can't successfully print out everything.

Cheats are entered for by the ability to disable sprite/sprite collision detection and sprite/background collision detection. When playing some games selecting these options will allow you to avoid being killed. A GAME AUTOFIRE option transforms your normal joystick into one with auto-fire capability. When you hold down the fire button the joystick keeps firing.

When finished manipulating the program in memory you have the ability to return to the program, exit to the desktop or go into the machine code monitor.

Monitoring

The machine code monitor offers all of the commands that you would expect to find such as assemble, disassemble, memory display etc. A number of other useful commands have also been added that make the monitor extremely powerful. Commands exist to edit characters and sprites. These aren't 'real' editors but allow you to enter a series of '%' and '%' in the shape of the character or sprite that you require. A disk monitor allows you to access and modify the internal memory in your disk driver. As well as being able to modify the internal, your drive's memory facilities exist to read areas of the disk in the drive into memory.

Speeded Up

I have already mentioned that the

Final Cartridge III has both a disk and a tape turbo.

To use the tape turbo you simply LOAD and SAVE programs with a device number of 7 rather than missing it out or using 1. The tape turbo is around ten times faster.

The disk turbo is automatically used with any disk command. The improvement on loading speed is around 15 times. It is worth pointing out that if a program is protected then not all of it will be loaded at turbo speed. Though this can be overcome by loading the program. In my own tests I found that my wordprocessor actually loaded slower when the Final Cartridge III was enabled than the same program did when the cartridge wasn't present - and that program doesn't have its own turbo.

Final Cartridge?

There can be no denying that the Final Cartridge III has some extremely powerful and useful facilities. My own view is that the Basic utility commands and screen dump facilities are excellent but that the desktop facilities, though extremely pretty, are gimmicky and anyone using the cartridge will soon get fed up of using many of the facilities offered. The idea of having a stopgap facility permanently available was extremely appealing to me as I could use it for writing quick notes and taking telephone messages, however when you move from Basic to the desktop any program in Basic memory is lost. In other words you have to SAVE your programs before accessing the desktop. In my mind this makes options such as the stopgap and calculator useless since you can't flick between them and your programs.

So would this cartridge be my Final one? Well to be honest it is good, but it's not that good.

Action Replay

Reading adverts in Your Commodore it sometimes seems that the Action Replay cartridge is upgraded, re-released every month. In fact the newest re-generation is only number four and is the most comprehensive to date.

So much is packed into this cartridge that Daniel has had a custom LSI logic chip designed by Motorola for the cartridge. As well as this there is also 512K of ROM and 8K of RAM inside the small red box that plugs into the cartridge port.

Back Again

As with all of the previous Action Replay cartridges the emphasis on this one is the ability to backup programs. When saving a backup you are presented with various options. You can SAVE the program as one of the following types:

Standard speed.
Turbo.
Warp 25.

Standard means that the program uses the normal disk/Computer LOAD routine and will re-load at the normal Commodore snail pace. A turbo saved file will re-load quicker than normal, however both of these options become redundant once you've used Warp 25 after all what's 2 times the normal LOAD rate?

Warp 25 files are of such a format as they can only be loaded either with the cartridge present or from a special loader program. An option exists within the cartridge to save the loader onto your disks.

All files saved at WARP 25 will re-load in 6-7 seconds, or so Daniel claims. In practice loading time is a little longer as you do need to LOAD and RUN the loader program if the cartridge isn't present, however this only adds a couple of seconds onto the loading time - who needs a parallel disk operating system?

If using cassette then you too have an option regarding the speed of the SAVE. TURBO saves your programs in such a way that they will re-load at between 3 and 5 times faster than normal. SUPERTURBO saves the programs so that they will re-load at 10 times normal. Super turbo requires that the deck is in good condition and that you are using good quality tape. If not the results can be unpredictable.

For those awkward to copy programs facilities exist to enter POKE into the program and LOAD parameters from a special disk available from DataL.

Pretty Pictures

As well as giving excellent backup facilities a number of graphic options also exist. As with the Final Cartridge III you can disable sprite collision detection enabling you to "cheat" at some of those difficult games. It's important to note that not every program will work with sprite detection disabled. Another parallel with the Final Cartridge III is the ability to edit sprites, however, the

editing facilities of the Action Replay IV are far superior. The sprite editor is a 'real' one with the ability to display sprites in either normal or multi-color mode, change the colours, alter the sprites, insert sprites, etc. In fact as a stand alone program the sprite editor would be fairly useful. For a games programmer this non-memory resident sprite editor is a must as it will allow them to stop their program at any time, tweak the way their sprites look and then carry on with the game. The non-programmer can have great fun altering the sprites in their favourite games.

Options exist to dump screen to a printer or save it out in such a way that it can be re-loaded by an auto package such as Blazing Paddles (also from DataL). The graphic data is not as versatile as the one on the Final Cartridge III and doesn't include sprites in the picture. Epson and Commodore printers are covered for.

One 'throw away' feature of the cartridge is the Text Modifier, this allows you to search through memory for a specific string and change it to another - great if you want to modify your own name to the high score table of a game before you SAVE it.

Utilities

A number of useful facilities are provided by the cartridge. These's a fast formatter for disk sets. A file copier will copy individual files, including WARP 25 files. You can even change normal programs to Warp 25 and vice versa. The file copier comes into it's own when you realize that it will work with two disk drives - no more tedious disk swapping! Should you want to copy a whole disk then a disk copier is provided for copying unprotected disks.

More from Basic

As well as providing the expected cartridge orientated facilities the Action Replay IV cartridge, like the Final Cartridge, adds a number of new facilities to Basic.

Firstly a DOS is included so that you can access the drive with ease, get disk directories etc. Furthermore the function keys are defined so that some commands can be entered with one key-stroke, for example loading and running the first program on disk.

A number of extra Basic commands are provided, not so many as the final cartridge but still useful.

Naming a few of the new

instructions:

GILD - will restore a NEW program.
LINESAVE - saves a range of lines to disk.

MERGE and APPEND allow you to mix/add two programs.

AUTO gives automatic line numbering.

PLIST sets a listing to the printer.

Monitoring

An extremely powerful machine code monitor exists within the cartridge.

Unlike all other monitors entering it doesn't perform a test to stop the program currently running. Upon entry all of the computers memory including the screen, stack and zero page are all frozen, all 64K of the computers memory remains unaffected by the monitor.

Once again all the expected commands are present, including disk monitoring and disk editing facilities. You can examine memory contents in hex, ASCII and CBM screen codes. Conventions between binary, decimal and hex exist as does the unusual ability to perform a Basic function.

In the Ring

Both of the cartridges looked at here offer the user essentially the same facilities. The Final Cartridge is more generously than the Action Replay cartridge and for me has a number of facilities that would soon become redundant.

If you are a newcomer to Commodore machines then you will probably like the pull-down menu/icon driven environment - very friendly. Furthermore, Basic programmers will no doubt find the wealth of useful commands useful.

If you are an advanced programmer and are more interested in programming your computer in machine code, then the monitor in the Action Replay cartridge is excellent. Disk editors will also find WARP 25 a delight. Don't forget you can even backup your own programs and save them at turbo speed.

So which one would I say was the overall winner? Well both cartridges have their own good and bad points and I could find a conflict one for both of them. I could say buy both, if you did you wouldn't be disappointed. Should I have to make a decision to purchase one then the Action Replay IV suits my requirements as a serious user far better than the Final Cartridge. □

Auto-Start Maker

Give your disk programs that professional look by making them auto-start

By K. Golden

Almost every piece of commercial software auto-starts when loaded from disk. Further more, many have screens that are displayed while the program is loading, giving information about the author or program instructions. Unfortunately, for many people who would like to give their own programs the professional touch, the process of auto-starting a program, let alone displaying a screen, is quite difficult.

The program presented with this article changes all of that, it allows you to alter any Basic program (less than 39K in length) so that it will auto-start on loading. It also allows you to design your own loading screen, using characters accessible from the keyboard, that will be displayed while the program is transferred from disk into the computer's memory.

Protection Plan

Apart from the convenience of your program auto-running, because the program auto-runs you will be able to protect your masterpieces from prying eyes. A simple method of protection would be to make the following instruction the first in your program: POKE 888,21

This quite simply disables the RUN/STOP and RESTORE keys. Further protection could be added, such as a routine to erase the program on a reset etc.

The AUTO-START MAKER program loads the Basic program into reserved memory. It then writes the program to disk with the necessary machine code, and the loading screen. This process adds about 6 blocks

(1.5K) to the program length, about 1K of which is the loading screen. To use the adapted program type: LOAD "programs".AJ

The .AJ must not be left out or the program will not RUN. If the Basic program loads any machine code files etc. it should contain POKE 137,0 before the LOAD command, otherwise the computer thinks it is in direct mode, and print the normal loading messages.

Auto-Starting a Program

A detailed breakdown of the operation of the AUTO-START MAKER is given below. Careful reading and following of these instructions should give success every time.

To start the AUTO-START MAKER simply LOAD and RUN it. There will be a short delay while it loads two machine code files from disk. The main menu is then presented.

The MENU has the following options:

COMMENCE AUTO-START PROCEDURE - This option reads changes and re-writes the Basic program that you wish to auto-start.

DESIGN LOADING SCREEN - Selecting this option puts you into the screen editor. To exit the editor press the F1 key. The screen that you have been working on will not be lost.

LOAD LOADING SCREEN - Allows you to LOAD a previously designed screen into the editor.

SAVE LOADING SCREEN - Puts a copy of the current editor screen onto disk.

READ DIRECTORY - Displays the

contents of the disk error channel on screen.

NOTE: It is not necessary to SAVE the loading screen with the above option. This simply allows you to SAVE a copy of a screen for later re-use. The COMMENCE AUTO-START PROCEDURE saves the editor screen with the 'new' Basic program.

To use the program simply design, or load a previously saved loading screen. F2 allows you to design your own screen. Use the normal keyboard characters and editing keys (cursor etc.) to design your screen. When the cursor comes to the bottom of the screen it will appear at the top.

The colour keys have no effect on the display as the colour of the loading screen is pre-determined by the colour memory on loading.

Once your screen is designed press F1 to finish.

Next select the COMMENCE AUTO-START PROCEDURE option (F1). You will then be asked if there is a screen in memory. If there isn't you will be returned to the menu.

The next prompt asks you for the name of the program that you wish to convert to auto-start.

Remember, this program must be in Basic and must be less than 39K.

If an error occurs then DISK ERROR will be printed on screen and you will be asked to re-enter the program name.

Once a program has been successfully chosen and entered into the computer's memory you will be asked to enter a name for the new version of the program. You can replace the original but it's safer to

give the program a different name.

Your program will now be re-written to the disk with the extra 6 blocks added and will auto-start on loading, as long as you remember the secondary address.

Getting it all in

There are two programs published in the magazine, AUTO-START DATA and AUTO-START MAKER. Type in both programs separately and SAVE them to disk before you RUN them.

The program AUTO-START DATA reads two machine code files from DATA statements into memory and then, via one of the machine code routines, writes them onto disk. The program AUTO-START DATA is no longer required.

The program AUTO-START MAKER is the program that you should now LOAD when you want to make an auto-start program. When RUN this will automatically LOAD into the computer's memory the two programs created by AUTO-START DATA.

When entering the AUTO-START



MAKER program pay particular attention to lines 170-199. Accuracy of these lines is essential for the program to work correctly.

Closing Notes

Although it is stated in the above text that you can't auto-start a machine code program with the routine presented here, there is an exception. If the machine code program has a line of

Basic with a SYS call it should then auto-start.

If you don't want a loading screen when your program is loading, go straight to the COMMENCE AUTO-START PROCEDURE option. When asked if a screen is in memory type 'N'. A completely blank screen will be displayed when loading back your auto-start program.

See listing on page 84

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Clear With Basic

Clear your text screen in many different ways with this handy set of routines

By N. Higgins

The clear screen function of the C84 does just that, it clears the screen in one go. In many cases this is all that you require within a program. There are times, however, that it would be nice to clear your screen in a different way just to make your program look that little bit special.

Presented here are some simple Basic routines which will enable Basic programmers to clear their screens in a variety of different ways, instead of the usual 'PRINT CLR:HOME'.

Using the ROM

Three ROM routines exist within the C84 that enable us to play around with the way that the screen is cleared. Two positions the cursor, the other clears an entire screen line. We will use these routines in some of the examples presented here. First it is important that we shed some light on the use of the routines.

To position the cursor you use:

```
POKE211,X:POKE214,Y:SYS987E
```

Or:

```
POKE781,Y:POKE782,X:POKE783,  
SYS9655D
```

Where Y is the row from 1 to 24 and X is the column from 0 to 39.

To clear an entire screen line you use:

```
POKE781,Y:SYS9980
```

Where Y is the same as above.

The Listings

Our first program LISTING 1, is the base for many of the other routines so give this in and SAVE it. When you enter the other examples you need only

insert the new lines given into a copy of LISTING 1.

If you RUN LISTING 1 and press a key once the screen is full, you will see the screen clear from top to bottom. You may not think that this is that fancy but it does get us started. Careful examination of the listing should make it clear how the program works.

Now let's reverse LISTING 1 and make the screen clear from the bottom of the screen to the top, nice, just type in the new lines of LISTING 2. Just by adding an extra variable (R) and incrementing this by one every pass through the loop we reverse LISTING 1. It's very simple and works a treat.

Now that we've got a couple of simple clear-screen routines let's just turn up a bit. Insert the new lines of LISTING 3 into LISTING 1 and RUN it. We now have a screen clear starting from the bottom left and going in an up/down fashion in columns of 10 characters.

On to the next routine. Add the lines of LISTING 4 to LISTING 1 and RUN it. The screen will now clear in four sections all emanating from the centre, very nice this one. Why not try to combine the four sections together so that they clear at the same time?

LISTING 5 gives a partial answer to the above problem, again add the lines to LISTING 1 to see the program work. RUN this and you will see the screen clear in four sections all at the same time.

Still not impressed? Okay, now for a couple of more dramatic routines. Insert the new lines of LISTING 6 and RUN it. After pressing a key you will see the screen contents disappear in a more unusual way, starting from the top left and ending at the bottom right.

The next example given is more suited, in my opinion, to games.

Maybe it could be used for clearing the screen then the game is over. Insert the lines of LISTING 7 in LISTING 1 and RUN it. You will now see the contents of the screen disappear from the four corners of the screen towards the centre. Excellent, and all from Basic.

If the routines presented here are too slow or too fast for your requirements, then you can alter them. Of course if you want to clear your screen really quickly then you will have to resort to machine code.

This brings us onto our latest example where we have a machine code routine that will clear the screen from right and left towards the middle. Add the lines from LISTING 8 to LISTING 1 and RUN it. When you press a key you will have to wait for a few moments for the machine code to POKEd into memory. Not very fast from machine code you might say, but by POKing memory location 49229 with a number from 1 to 255 you can change the delay. 1 is the fastest and 255 the slowest. Even with the delay set to 1 the routine isn't the fastest that could be written, then again, if the screen was cleared any faster then you wouldn't see it so what would be the point of using a fancy routine?

Back From The Past

For more examples of clearing the screen with machine code, refer to a past article in Your Commodore September 1986 called "All Clear".

Incidentally you could use the ROM routines mentioned in the article to position the cursor anywhere on the screen. Just set up two variables X and Y to the correct column and row and produce a subroutine to call the ROM routine and position the cursor.

See listing on page 70

starting the
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on Basic.
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from 49223
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Games Update

The perceptive among you will have noticed that we have adapted a new style for reviewing games this month. Not every game received will now get a full review. Instead, four to six of the most interesting games will get reviewed in depth each month and the rest will get lumped together in one large summary. This style is largely experimental so please write in and let us know what you think.

Fall Price Games

APOLLO IS (Electronic Arts) is an appropriate title to launch the new section. Here is your opportunity to participate in a cross section of missions from the American Space Program. You must blast off, dock, land on the moon, explore the moon's surface, take off from the moon and re-dock, walk in space and finally re-enter the Earth's atmosphere and splash down if you are to accomplish everything successfully.



The game looks as if it is going to be an extremely complicated flight simulator but in fact, it is considerably simpler than that. Most of the actions required of you involve no more than pressing your fire button at the appropriate moment. Be warned though, timing is absolutely critical measured in thousandths of a second and too great an error will result in the entire mission being aborted.

The program itself is extremely well constructed ranging from the variety and quality of the graphics to the crackly speech which adds just the right amount of atmosphere. All that is really lacking is gameplay - there just isn't enough of it and I fear that more space fanatics will soon tire of the game.

Another way of exercising your grey cells, albeit somewhat easier than piloting a space rocket is answering



questions on one of the memorable quiz shows on television. Should you not be able to get enough of your daily fix, Denmark have come to your aid with a computer version of **BLOCKBUSTERS** on their TV Games label.

For anyone unfamiliar with the game, the playing area consists of a matrix of hexagons each containing a letter. The players are then asked a question the answer to which begins with the letter that is in the hexagon. Getting the answer right changes the hexagon to your colour and the object of the game is to form a continuous line of your colour joining opposite sides of the grid.

The game is designed for two players and this tends to cramp things somewhat round the keyboard. The computer decides which player has pressed their 'buzzer' first and invites them to type in their answers. In theory, it doesn't matter so much if your spelling is a bit iffy as the computer will 'guess' what you meant and answer accordingly. This worked well on some occasions and badly on others. Surely it would have been better to ask the player to shout out the answer and use the joystick to point to a light or wrong box accordingly.

On winning the best out of three games, the victor is invited to take part in a Gold Run which is more of the same except that phrases instead of single words are used. This unfortunately degenerates into a test of typing speed rather than any other ability. The graphics are adequate complete with a digitised picture of the host Bob Holton shaking his head demurely. The game itself though does not adapt particularly well to computer format and I would suggest that you stick to watching it on the box.



OCTAPOLIS from English Software is a very slickly produced shoot-'em-up but you can't help but feel that you have seen it all before. After the usual inane plot, it transpires that as usual, you are the only person in the entire galaxy who is immune to the threats of the Galactic Imperium and it is up to you to save the world. Again!

The game is in two parts starting off with you attempting to blast every thing in sight. A split screen is used to represent the action in 3-D (remember Naamim) and you have to shoot down a given number of battle fleets before you are allowed access to the second part of the game. After successfully dodging, you are transported below the surface of the city where you must leap from platform to platform avoiding man-eating robots and evil eyes. Comparisons with Impossible Mission are I am afraid inevitable. Get out of this one and it is onto the next city etc. etc.

The game actually plays very well but surely there must be some originality left in this industry somewhere.

Part of the cash worth 2000 AD will be invested in the next offering - **SLAIN** produced by Marvell. The land of Lyonesse is under the evil reign of the Divine Lords and it is up to you, Slain, with a little help from your nameless willing sidekick Hiko to rid the land of this terror.

Slain is a menu driven adventure although it is unusual amongst similar games of this genre in so much as there is also a combat system. Slain's actions are also governed to some extent by his warp rating. This is a measure of his strength and power which decreases as he gets wounded or hungry. Maximum warp power is needed before Slain can go benefit it

combat.

This game is totally ruined by one screen glitch in the game design. The Reflex system of selecting your commands. The initial series of actions flows as main (thought) scroll and flash across the menu box. You have to control a scroll wheel and point to the command that you want. Timing is important and if you misjudge things, you are quite likely to select something entirely different from what you intended. This is no more than a glitch but it renders the game unplayable to all but the most ardent 3000 AD fan. Certainly, traditional adventures will hate it.

If you have ever dreamed of being a



Yippie, if only to be able to afford a Porsche, **TEST DRIVE** from Electronic Arts may prove to be the best bet here. You are given the chance to test drive one of five of the world's top sports cars. Apart from the Porsche 911, there is also a Lamborghini Countach, a Lotus Turbo Esprit, Ferrari Testarossa and a Corvette.

Obviously these are not cars designed to stick to American speed limit of 25 mph. With top speeds in some cases of over 178, it is only natural that you would want to put to the car through its paces. The only trouble is that the local police are none too happy if you try to burn them off. Some you can pull away from but others will force you to stop and accept a ticket like a man.

Test Drive plays reasonably well but is lacking a certain something that keeps it from being one of the top notch racing simulations.



128 different levels coupled with 8 different bonus screens sounds like the committed rigger's dream come true. **HUNTER'S MOON** from Thalassia is their fourth shoot-em-up but unfortunately their weakest to date.

After inadvertently entering a black hole, you find yourself in a strange region containing hive like structures that regenerate almost as quickly as you can blast them. Your task is to locate all the Starvills on your radar and collect them. As you progress through the various systems, so you can gain co-ordinates allowing you to skip levels.

Although the game is very well put together, I found it lacking that one vital ingredient of all classic shoot-em-ups, addictiveness.

Another shoot-em-up on offer is **M.A.C.H. II** from Starvision, a Danish company. Again, the plot is somewhat familiar. As **Knights of the Galaxy**, you are trying to rescue three planets from



slavery.

The only thing about this game likely to tempt anyone other than total arcade fiends is the offer of an Amiga should you find the secret password. Otherwise, you've seen it all before.

Budget Games

CODE HUNTER from Firebird sees you battling against a bandit of unknown origin. Your only hope is to discover the necessary codes to deactivate it. To do this, you must enter each of the computer networks and destroy the guards there before you can escape with the relevant bit of code.

Each section of the computer consists of a screen made up of squares. You move round this leaving bombs onto which you must lure the guards. The problem is that the squares consist of one way transporters, teleport systems and energy modifiers. This means that your path must be chosen carefully.

This is a nice little arcade/strategy game let down slightly by poor graphics and the fact that once you have worked out how to complete a

particular screen, you need never get killed there again.

LEGEND OF THE AMAZON WOMEN from Mastertronic is a horizontally scrolling beat-em-up. The Amazons were a ferocious tribe of female warriors although you would never guess it from this as they look more like they are trying to take each other with feather dusters rather than beat each other brains out. All this play acting to dodge numerous arrows. Give it a miss.

ARAC from Addictive is a much better game. Originally released at full price, it never received the recognition due to it. An arcade adventure with some good graphics. You are Arac, a droid albeit with a few bits and pieces



missing.

As well as retrieving your missing legs and power orb, you must also send your net to capture the various creatures that inhabit the labyrinth. These will then help you in search for their freedom. Each of the five creatures has different powers eg the big lion can gnaw through solid walls whereas the rat will help to confuse the enemy radar. Definitely a game worth looking out for.



PUB GAMES from Alligata is another previously full price offering that may appeal. Seven different games that you play from the comfort of your own armchair, presumably with a can or two of ale for accompaniment.

There are a number of quibbles in the game such as players snapping cues just away through the events but on the whole, Pub games is a good laugh and a worthwhile aside to all these deathtrap type games.



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printouts that professional
touch with this
Basic subroutine*

By D.J. Tripp

Computers are excellent for performing repetitive sequences of complex mathematical calculations, and churning out large masses of highly accurate answers. One thing that most versions of the Basic language are very bad at is giving you the result in a neat and readable form.

In this respect, Commodore Basic is typical. There is no way to control the format of the numbers, with the computer making its own mind up when to change from the "decimal" (123.456) to the "scientific" (1.23E+4) modes. You cannot decide how many digits will appear after the decimal point, or if there are to be "trailing zeros" to pad all numbers out to a standard length. As a consequence, the length of number strings may vary from three (big-one digit and the following space) to sixteen characters (big-nine digits plus decimal point, "E" sign, two-digits and following space).

The commands available for controlling the print-out are also primitive. The TAB, SPC and "comma" functions are all cunningly arranged to work to the start of the number string, so unless your answers all have the same number of digits ahead of the decimal point it wanders around the columns at will. This is especially annoying when you are printing out columns of money.

The "comma" tabulation facility is usually of little or no use, especially when there is no way to control the column width it provides. The C64 prevents this to an extent, which means that although short strings do line up reasonably nicely, the longer ones spill outside their own columns and force the next number to be displaced into the next one, which in turn often means on to the next line. You are almost certain to end up with your

numbers scattered at random across the page, with the headings either sitting over the spaces between the numbers or over the wrong column altogether!

In many cases, use of the "Rounding function", or:

$FN(RN)=INT(1000*N+.5)/1000$

to give in "three decimal places" form, together with the TAB function, will give a reasonably neat layout to be put to the screen. However, this function does not stop the numbers switching from normal to scientific notation, and the TAB, SPC and "comma" will line up on the first character.

In addition, there are two other nasty lurking in the background which this method is powerless to deal with:

- Your printer almost certainly does not recognise the TAB function, and the position will wander all over the place. All the effort you have put in to get the screen layout nicely organized is therefore wasted.

- There are certain "magic" numbers which do not print out as you would expect them to, and instead of getting the expected number of decimal places printed, you get the full length string. If you are trying to fit numbers into narrow columns, these numbers will spill out and upset the rest of the line.

If you have not met these "magic numbers" before, try entering "PRINT 5.517" in immediate mode or as a line in a program, and see what happens. There are quite a lot of these numbers, and if the result of any calculation, including the "Rounding Function", hits them, this effect occurs. Try rounding $100*PI/10$ to three places of decimal to see another "magic" number. Again, this problem is not a Commodore Basic exclusive.

TABULATE was written to overcome most of these problems, and to provide a few other aids to neat result tables while it was about it, leaving you free to think about the real job your program is supposed to be doing.

It doesn't do all the work for you, in that it cannot decide on the best layout for your answers—you still have

to think this out for yourself.

What it does do is let you choose such things as the numerical notation, the width of each column, the position of the numbers within this column, and the number of decimal places displayed in a simple way, and to let you alter them without having to rewrite half your program to keep the whole thing presentable.

It also lets you put the headings nicely centered over each column, and keeps them there if you change the column width.

TABULATE works with the output sent to screen or printer looking the same, as it does not use the TAB function. Because of its simple control over the column widths and the type size of the numerical strings, you can experiment with the layout with these set to give everything contained within the screen boundaries, and when satisfied, change the parameters so that it fits the printed page to better effect.

I cannot claim it to be perfect. One thing it does not overcome is the fact that you cannot set spacings to a half-character value. Depending on whether the numbers and headings have odd or even character counts, and the column widths are odd or even, so some headings may look to be off-set to one side or the other of the "visual" centre of the column. If this happens, try increasing or decreasing the offsetting column width by one.

General Description of the Program

TABULATE makes use of the "Rounding function", combining the with extensive use of the string handling functions to perform its various tasks.

The program is controlled in two ways, by the means of a "format control string", FMS (see below for a description of this), or by direct specifying one or more of the program constants.

Once the format has been established for each column, its headings are printed by assigning its text to P#8, and the numbers to assigning their values to P#.

Sample of Tabulate Demo

PER MONTH			
YEAR	PERCENT	PERIOD	TOTAL
1980	100.000	1	1000000000
1	0	0	0.00
1	0	0	0.00
1	0	0	0.00
1	0	0	0.00
1	0	0	0.00
1	0	0	0.00
1	0	0	0.00
1	0	0	0.00
1	0	0	0.00

PERIOD WITH DATA LENGTH
 100 0000 0000000000 1000000
 00 0000 0

PER MONTH			
YEAR	PERCENT	PERIOD	TOTAL
1980	100.000	1	1000000000
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00

PERIOD WITH DATA LENGTH
 100 0000 0000000000 1000000
 00 0000 0

PER UNIT LENGTH			
YEAR	PERCENT	PERIOD	TOTAL
1980	100.000	1	1000000000
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00
1	0.01	0.0000	0.00

PERIOD WITH DATA LENGTH
 100 0000 0000000000 1000000
 00 0000 0

Printed value values of data as given in the program. Note the consistent structure of PERIOD as first line column 2. constant effect in last column.

Notice effect obtained by changes to PER UNIT LENGTH.

Same column widths, but amount of header text, again in DATA statements. Note that last 4 characters are blank.

section should help you identify what each variable is used for.

•**READ FMS** (lines 61000 to 61210) reads the format string (FMS) to extract the new parameters. You enter this routine with a valid format string (see below).

•**FORMAT AND PRINT PER/PS** (lines 62000 to 62550) forms the main part of TABULATE. You call this routine to print either the column headings (sent as PER) or the numbers (sent as PS) to the current format.

This routine does not send a "return" after it prints the formatted result, so you must follow it with PRINT if you have come to the end of a line.

Note that PER and PS are automatically cleared by this routine, and their values are not available for use by your program afterwards. If you want to do this, you must assign them to some other variable first.

•**REFORMAT & PRINT PER/PS** (line 63000) is a one-liner which is included for your convenience. It allows you to define a new format via FMS, and a new input number or heading, and make just one call to this routine to print out the new items in the new format, rather than calling parts 2) and 3) separately.

FORMAT STRING FMS

This string is most useful if you want to change all or a few of the formatting parameters from the default or current values in one go.

FMS is made up as follows:
 FMS=" <CO> <TY> <PL> <JU>
 <SI> "

where:
 <CO> = (C)Column width, or field width

<TY> = (T)Type of numerical notation

<PL> = the number of decimal places to be displayed

<JU> = (J)Justification of item in the column

<SI> = (S)Size, or the number of decimal places expected ahead of the decimal point. This is only used with the "Rounded" notation, allowing you to position the decimal point so that there is sufficient room to the left of it to accommodate the largest number you expect in your answers. If you set SI too small, you may find the bigger numbers are pushed to the right to get them in, and your next line of decimal points is spoiled!
 The types available are:-

Tabulate

The program sorts out what you have and if, you don't have to alter anything else to go from text to numbers.

There are four parts to TABULATE:-

•**INITIALISE, DEFAULT VALUES** (lines 60000 to 60600) is a short initialisation routine which sets up the default values and defines SPB

(which is used by the justification routine, part 3). The values given in the listing are my own choice; you can obviously change these to suit your own requirements. This routine must be called before any call to parts 2) or 4) are attempted, unless you incorporate equivalent lines in your own program, in which case you can leave part 1) out altogether. The various REM statements in this

D - The normal or "decimal" notation, (rounded up to (PL) places of decimals. (Note the rounding up is done on the ABSOLUTE value of the number, thus -1.2 will be rounded to +1.2 to one place of decimals, rather than 1.0. Numbers with less than PL decimal places after the decimal point will be padded with trailing zeros.

M - (old-style) format. As "E" rounded, except that the numbers are broken up by the conventional commas at the thousand, million and one thousand million points.

S - (Scientific) notation, again with the values rounded up as described for "E" notation.

E - (Engineering) notation. This is similar to the scientific notation, except that the powers-of-ten change in steps of three. Probably most used by electronics engineers.

U - (or any other letter except R,S,M or E) - (S)huffled prints numbers just as the computer sends them. Most useful if you have chosen the "E" format and all your printouts are 0000. Change the format to "U" and it will let you see if it is your program that is at fault, or if you have chosen an inappropriate format for the results!

The output may be: (S)huffled

- L** - to the (L)eft of each column
- R** - to the (R)ight of each column
- C** - (or any other letter) except L or R - (C)entered, with the decimal points aligned down the column.

"Read FMS", routine 64000, reads FMS from the bottom of the file. If the first item is a NUMBER, this will be read as (C)olumn width. The first LETTER is taken as (T)ype, and so on.

Therefore, if you want to change the number of decimal (PL) places displayed, you MUST precede it with the (T)ype you are using, as otherwise "Read FMS" sees the number as (C)olumn width. Similarly, if you want to change the (LU)ndification, you must precede it with the column (T)ype letter, as your LU letter will be taken as the (T)ype, with (LU)nd if you have included @) read as PL.

Within these rules, any item may be omitted, in which case the variable it represents will retain its current value. Once you have set up all the format values (by GOSUB 60000), you

only need to put in the things you want to change.

Examples of valid forms of FMS are: FMS=" " gives all default values.

FMS="0M4C4" modifies all the parameters.

FMS="R04" (C)olumn width and (PL)aces unchanged, "R" rounded notation selected with an (M)ax of 4 characters ahead of the decimal point.

Formatting with Tabulate - Demo

The power of FMS formatting comes into its own when you want to make up complex tables with many changes of format. In this case, you can load all the FMS values into a string array from easy-to-find DATA statements, and call them up either from a "FOR...NEXT" loop which also calls your results in order, or by the array number in the sequence you require them.

In some cases it will be found quicker to change a single formatting parameter directly. For example, if you only want to change the column width from its last value to, say, 20 you would just put "C0=20" before the next number.

I have included a short (ish) program, called by the inspired name of "DEMO", which should make use of both methods of control clearly. This little program shows in particular how FMS and the four routines of TABULATE can be used to best advantage.

The program itself does not do anything very clever, and most of it consists of table formatting (I did say at the start that you may still have a lot of work to do!). But you will see how all the controls for the printout can be contained in DATA statements, and how the "read FMS" routine may be used to extract information from the data to control, for example, the lengths of the dividing lines separating the parts of the header.

DEMO prints the DATA lines out for you after each run, so you can easily make changes and re-run the program to see the effect. (As writers, some of the choices made initially are not too clever - see how quickly you

can modify this, and then think back as to how you would have done it before the advent of TABULATE).

Getting it in

TABULATE is written without using any of those horrid "Commodore Graphics" symbols, so entering it should present few problems. However, there are some deeply nested functions, so count the brackets carefully! You use "erase" the program if you want to by listing out all the REM and spacing ("SPACE ") lines. The program is numbered to let you do this without the danger of GOING to a non-existent line.

Type in the program, and save it to disk or tape.

TABULATE is intended to be tucked on to the end of your own program, and is numbered accordingly, if you own an extended Basic or utility cartridge that gives you the MERGE or APPEND ability, then life is easy for you, and you can add it to existing programs using these means. If not, you will have to tape TABULATE on to the end of existing programs each time.

For new programs, load TABULATE first, and then compose your program on top of it.

If the line numbers clash with existing lines in your own program, then renumber TABULATE accordingly but make sure you alter the GOTO's and GOSUB's properly if you do.

You must also check that the variables used by TABULATE do not clash with any in your own program. Tabulate uses:

CO,DD,IV,DL,FMS,LU,PLS,
PLJZ,FNR,SE,SPS,TV,VE.

If you are in the habit of compiling your Basic programs, especially with PETSPEED, you may find that two lettered variable names such as those cause strange things to happen. If the owners, you will have to rename them as C1,D1 etc. I make no excuse for so doing this in the first place - most of the names were chosen either because they formed an easily remembered mnemonic (CO,TV etc) or were a bit strange and unlikely to be used by anyone else (DD,SE etc).

See listing on page 97

Tabulate

Mini-Putt



Forget Leaderboard and forget Golf Construction set; this is the way golf is really played by millions on the world's only golf course, Electronic Arts' Mini-Putt contains four of the craziest courses to test your skill, courage and mental ability.

The game was written by Electronic Arts by Accolade who were the team behind games like Hardball, Kofed Until Dead and Classics and other recent EA games - Test Drive and Apollo 18. All these games have one thing in common as they combine addictive gameplay with great graphics.

The Mini-Putt screen is divided into four sections. Two thirds of the screen shows a top-down view of the hole being played including the ball and a cross that is positioned using the joystick to decide the direction of the shot. Below that on a picture of your mini-golfer with a speed and accuracy gauge, a map of the entire hole (since most holes are bigger than a single screen) and a record of shots taken and the put for the hole.

To take a shot you must line up the cross in the direction you wish the ball to travel in (you can move onto the other screen that make up the hole by moving the cursor off the side of the screen) which also changes the distance by the golfer. Pressing the fire button starts a bar moving up a gauge so that the release of the button determines the strength of the shot and also starts a bar moving over the accuracy gauge. This has a single line that you must stop the bar on by pressing the button since any error will mean you hit the ball off target. When you release the button the ball hopefully heads towards the hole.

That's the theory which should work everytime on a flat

green. Unfortunately, this a crazy golf and theory takes a back seat as the courses are far from flat and contain a variety of obstacles put in your way from variable slopes to walls, bridges, an aeroplane, elephant, castle and even the Taj Mahal!

The four courses are given the misleading names of Deluxe, Classic, Traditional and Challenging which you'll soon realise are no standard, curious, traditional and impossible. Each course consists of nine holes and can be played by up to four players who take their shots alternatively with the result of the preceding hole deciding the playing order. The holes vary from par one to three which often means that the player going first is used by the others as a pitiful pig.

The Deluxe course is the easiest with the holes consisting of walled paths and a set work of slopes that are marked by coloured areas with arrows showing the direction of the slope. This may look simple but it's not easy to pick a shot through a course littered with slopes. At the end of each hole the scores are displayed for each hole as well as the running totals and the par for the course so far.

The classic course is undoubtedly the best as it contains some of the hardest holes in Mini-Putt. Hole two is particularly difficult thanks to an elephant that's sitting right in the middle of the course. To complete the hole within the par three you have to time your first shot to avoid the elephant's trunk that will hit you into an impossible position, over a narrow bridge that spans a river, navigate through a series of slopes that will steer you back over the river, this time via a continuously positioned boat, through a gap in a wall past the winking elephant's tail and into the hole!

The reward for completing the hole is a chance to fall on a traditional windmill before trying to get your ball past a revolving aeroplane propeller and then into a canyon that fires you over the walls that totally surround the hole. This course also features walls with small holes in them such as the ones in the castle wall that you must hit the ball in only to find that it doesn't re-appear in the obvious direction but in the worst possible place. There's one hole where the exit varies depending on how many players have passed through and anyone who tries to copy the success of a player before them will find themselves going backwards.

The traditional and challenge courses are back to the simple walls, water and slopes of the first course but these are arranged in such a way that you have to be exact with your shot's strength and direction and take your life in your hands not to break even. This is Mini-Putt at it's toughest as the slightest mistake could cost three shots. The on screen golfer will mimic your actions and will jump with joy if you send a par or even a birdie or hole in one which is accompanied with a flourish to impress the neighbours but he will stand silently over the hole if you go over par and break his club over his knee in disgust if the shot ends up in water.

Finally, two pieces of advice. The first is printed on the packaging and advises you to remove any breakable objects so they don't get batted across the room, and secondly if your opponent 10 puts a par three - don't laugh too loudly as it could happen to you on the very next hole.

A superb new twist to the Leader Board style of hit and hope golf game.

E.R.

Trademark:
Title: Mini-Putt, Supplier: Electronic Arts, Lampy Business Centre, 11-19 Station Road, Lampy, St. Margt, Kirkc. 32.2 818. Tel: 0753-69442. Machines Ltd. Price: £9.95.

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MAH JONG COLLOSSUS

Mah Jong is an ancient Chinese game full of flowers, seasons, winds and dragons and packed with the mystery of the Orient. It is also the latest in the Colossus series of strategy games from CDS. If you've ever seen the Chinese playing Mah Jong at invariable speeds you may have noticed a blur of bamboo and ivory tiles covered in mysterious symbols. These symbols have now been transformed into C64 pixels that accurately display the suits and majors of Mah Jong.

Mah Jong is played with a set of 144 tiles that are shuffled (or washed or twiddled) and laid into a wall and then dealt to the four players who are known as East, West, North and South. The object of the game is to build up a complete hand of 14 tiles that consist of pangs (3 identical tiles), Kongs (4 identical tiles) and chows (a run of three tiles of the same suit) and a pair. You begin the game with 13 tiles and take it in turns to take a piece from the wall and then discard one. You can jump a turn by claiming a discarded piece for a pang or a kong but you can only claim a chow from a person playing before you.

This simple game system has prompted many to compare Mah Jong to the card game rummy but a few hands of Mah Jong will convince you that this offers a lot more. Each of the three Mah Jong suits (big bamboos, circles and diamonds) contains four tiles that range from one to nine so there can be a straight if more than one player is going for the same pang. The two-to-nine of each suit are considered minor tiles and a pang of them is only worth two points whereas a pang in the major suits or suits is worth four points. The Mah Jong set also contains winds and dragons that are not only worth four points per pang but a pang of dragons or your own wind will double your score. There are also four flowers and seasons that correspond to the four players and will score a double if you get your own and three doubles if you get all four seasons or flowers.

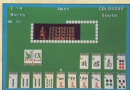
Two points for a pang and even with 20 points for going Mah Jong may not sound a lot, but through skillful play and the collection of pieces that give you doubles you can build a score worth hundreds or even thousands in a single hand! To add to the drama the player who is currently East pays and collects double his score when the totals are compared at the end of a hand.

To amass a really big score you should go for one of the special hands that can earn you 1000 points in a single hand. These hands have amazing names to match their value and the difficulty to create them, but should you collect hundred treasure, four Blessings hovering over the door, imperial jade or a gates of heaven you should enjoy it as it may be a long time before you see another one.

Colossus Mah Jong provides you with three computer opponents that can play at nine different skill levels and the inclusion of features such as 3D displays of the tiles, a grid in the centre of the screen that neatly displays the discarded tiles and the ability to turn on and off game components such as special hands and hidden discards to make the game as difficult or easy as you want.

A full game of Mah Jong consists of four rounds which contain as many games as necessary for each player to have a turn as East. This can often be more than four as East remains East if he goes Mah Jong. On the computer as in the real game this can take several hours but you can shorten this by only playing one or two complete rounds.

I have played Mah Jong for over ten years and have often wondered if it could or would be computerised and whether such a version would accurately display the pieces and include the special hands. Now CDS has done all that and



added a tutorial program to introduce the pieces, and special hands so beginners can learn the game with patient computer opponents for the cost of a computer cassette or disk before spending £20-30 for a full set.

The gameplay although accurate can be quite slow but this is acceptable as Mah Jong isn't a game to be rushed. I found the screen display to be clear and accurate although a little difficult to distinguish between the five and six characters if you don't know Chinese patterns. Sound is kept to a minimum of beeps whenever a player gets a flower or season or a pang or kong is claimed. Colossus Mah Jong is a highly playable and accurate version of the expert strategy game and to that nine computer opponents that will challenge all but the best players and you have a truly colossal program. **T.H.**

Finalities:

Title: Colossus Mah Jong. **Supplier:** CDS Software, CDS House, Breckin Road, Dunstable, South Northants, Tel: 0561 21104. **Machine:** C64. **Price:** £8.99 (incl. £2.99 del.).

Bothersome Basic

Basic can bewight or bemuse, but it can also be fun

By Norman Doyle

Before we can indulge ourselves in an artificially intelligent program, we still have to tackle arrays and data — probably the most avoided subjects in Basic programming.

I've already shown that a variable is simply a storage box for numbers, or for groups of letters and/or numbers, known as strings. These work well in most cases but what happens when you have a list of names that needs sorting or into alphabetical order?

Normally, you'd make a list of the names and then create a second list pulling out the names into alphabetical order. The computer can behave in a similar fashion but first it needs a list to work from.

When we make a list, the computer is notified by the word DATA:
 10 DATA PETE, JEFF, JOHN,
 FRED, FRAN, ALEN, ALAN

The computer now knows the names but needs to store them in some sort of numbered list so that it can juggle them around. For this we use the array.

An array is a series of variables having the same base but with a qualifying number in brackets, for example:
 A(1)%, A(8)%, NAME\$(1),
 NUMBER\$(2)

A small array, one using values from 0% to 9%, can be created simply by using them in a program. A line string something like XC(12)=21 automatically creates the X array with 12 elements numbered from zero to nine inclusive.

Large arrays have to be DIMensioned. In other words, the computer has to be informed of the maximum number of elements which will be used. For example, DIM A\$(2) will create a string of arrays with 15 elements, remember there is also A\$(4). The largest, one dimensional array has 256 elements and would be set up by something like this:

DIM NAME\$(255)

Arrays are ideal for use with DATA statements. One line of Basic can set up several variables instead of interminable equivalence statements, that is NAME\$="PETE"; NAME2\$="JEFF" etc. In our sorting program we can set up the variables by READING the data as follows:

20 FOR A=1 TO 7:READ NAME\$(A):PRINT

This replaces the long winded alternative which would take up an awful lot of memory with a dimensioned array of 256 elements, not to mention the boredom of typing it all in!

The purpose of this exercise is to show how the sort interacts with the array system so we need to print out the names in their original order as the array is set up:

20 FOR A=1 TO 7:READ NAME\$(A):PRINT NAME\$(A)"";NEXT:PRINT

Run the program and you'll see a row of printed names which corresponds exactly with the order given in line 10.

Fortunately strings can be compared to each other using the greater than and less than symbols. Even names which are similar in spelling such as FRED and FRAN can be sorted in this way. FRAN will be treated as having a value which is less than that of FRED. Even a pair of names like GEORGE and GEORGINA can be separated into alphabetical order using one of these symbols.

In our program we want to compare two names and then swap their places in the array if the second name should precede the first one in alphabetical order. Using the first two data items, PETE obviously follows JEFF in an alphabetical list so a

statement such as:

IF NAME1 > NAME2 THEN...

would be true and whatever followed the then statement would be executed.

The statement would close by exchanging the contents of NAME1 with the contents of NAME2. If we just said NAME1=NAME2 we would change PETE to JEFF but both array variables would then be JEFF and PETE would be lost. We need to move PETE out of his variable into temporary storage, copy NAME2 into NAME1 and then bring PETE back out as NAME2. You may have noticed that NAME0 has not been used yet so here is an ideal temporary home for PETE:

IF NAME2 > NAME1 THEN NAME0=NAME1: NAME1=NAME2: NAME2=NAME0

This would be quite sufficient but PETE now needs to be compared to all other names before he finds his place. The use of variables gives us a new use for a loop.

```
30 FOR B=2 TO 7
40 IF NAME(B) > NAME(1) THEN
  NAME0=NAME(B):NAME(B)=NAME(1):
  NAME(1)=NAME0
50 NEXT B
60 FOR C=1 TO 7:PRINT NAME(C)"";
  NEXT:PRINT
```

Running the program will compare PETE to all of the names in the list.

Now we have to compare all the names by introducing a new loop using variable B.

```
30 FOR A=1 TO 6:FOR B=2 TO 7
70 NEXT A
```

Now the program is complete, a careful study of the screen print out of each series of 7 changes will show how the sort program works. Remember that the name will only move if the word that follows it has a higher value.

Commodore Modem Revealed

Why suffer the deficiencies of commercial software for your modem when you can write your own?

By S. Henderson

The Commodore modem is used by many people for accessing the CompuServe database, Protrek and bulletin boards. When using the modem, most people use software provided by one of the services mentioned, never dreaming that they could write their own software which would make the modem far easier to use.

This article will describe how you can make the modem work other than under CompuServe, Viewdata, or teletype software. The modem can only handle 1200 baud reception but can transmit at 15 baud, or 1200 baud. This means that it can receive around 120 characters per second, and transmit at either 120 characters per second or at 15.

Due to limitations of the hardware, when 1200 baud is being used for transmission, no reception can occur. This is why those of you who have used half-duplex CompuServe access numbers will have seen the arrow showing the direction the data is travelling. Half-duplex only lets information go one way, whereas full-duplex lets data go in both directions at the same time if required. Full-duplex is used for normal CompuServe and Protrek access at 1200/15.

The Commodore modem is extremely versatile. It has various types of parity (error-checking) built in, and can quite easily be programmed by the user, with the necessary know-how and technical information, much of which will be covered in this article.



Accessing the Registers

Many of the modem's internal registers (memory locations) are accessed by POKEing memory location 56833 with the number of the register that you wish to access, and either POKEing or PEEKing location 56833 with or for the information to be sent to or retrieved from the modem's register.

It is worth pointing out that in machine code, interrupts must be disabled when the modem is being used. Also when reading memory location 56833, due to a timing problem, the LDA/LDS/LDY instruction must be given twice.

In Basic, no problems are experienced as the commands will be performed much slower.

Details of the modem's registers

are shown in Figure 1. All of them are used to control the modem when accessing information from the telephone.

Jump Tables are used to access useful routines that control the editor, read frames from CompuServe among other things. Information is given on some of the more useful of these.

All of these routines are called from Basic with a SYS command. You should see JSR when using machine code.

ADDRESSES

- | | |
|-------|--|
| 10004 | "RE-CONNECT" after the OFF command has been used. |
| 10027 | Access the EDITOR. |
| 10030 | Perform the CONNECT command. |
| 10072 | Create a new EDITOR frame. |
| 10066 | Put current screen display into the editor (see above call BEFORE this one). |
| 10068 | Send current EDITOR frame to a Commodore printer. |
| 10075 | Perform the EDITOR "LAST" command. |
| 10078 | Perform the EDITOR "NEXT" command. |
| 10081 | Perform the EDITOR "GET" command. |
| 10084 | Perform the EDITOR "DORS" command. |
| 10089 | Wait for a key after prompt. |
| 10099 | Wait for a key. |
| 10102 | Reset the modem and initialise variables. |

Auto-dialling

The auto-dialling features of the modem are fairly powerful. The program at the rear of the magazine will automatically dial a number, or get a name from the DATA stations, and then engage in user to user chat.

The F1 and F3 keys are used to swap between who is sending and who is receiving, and the F7 key will drop the line. Note that if only one end presses F7, the line will still be connected for the other person, unless he keys F7.

The RUN/STOP key is NOT disabled, so do not press it when using this program, or the modem will remain on line. To stop this, use the modem RESET command: (POKE 26832,3:POKE 26833,32)

This article should have whetted your appetite just enough for you to start writing your own software for your Commodore modem. ☺

See listing on page 96

Figure 1 - The Registers

Register 0 - STATUS - READ ONLY

Bit 7 - LTRDY - Ready to transmit

Bit 6 - LRDY - RXed data available

Bit 5 - LDCD - 2 sec. carrier detect

Bit 4 - LFERK - Framing error

Bit 3 - LFER - Parity error

Bit 2 - LKCD - 0 sec. carrier detect

Register 2 - MODE - READ/WRITE

Bit 7 - LPO/E - Parity bit = even
low = even

Bit 6 - LPO - Parity bit = off
low = on

Bit 5 - T1200 - TX hand bit = 1200
low = 15

Register 3 - COMMAND - READ/WRITE

Bit 7 - LRSN - Receive enable

Bit 6 - LTXEN - Transmit enable

Bit 5 - RESET - Set to reset,
cleared when complete

Bit 4 - LDREN - Demodulator output buffer enable

Register 4 - LINE RS/TS -

READ/WRITE

READ - DATA BYTE RECEIVED

WRITE - DATA BYTE TO TRANSMIT

Register 6 - CONTROL PORT - READ/WRITE

Bit 2 - TXFLT - TX hand filter
Hi = 75

Bit 0 - SEIZE - Seize line

Register 8 - DIAL & TIMERS - READ/WRITE

Bit 7 - UK/EUR - UK/European
chaffing EUR is
low, UK is high

Bit 6 - WSEC - 0.5 sec. timer, set to
start, cleared when
complete

Bit 5 - DIALGO - Set to start dial,
cleared when digit
is dialed

Bit 4 - L5SEC - 1.5 sec. timer, like
bit 6 but shorter

Bits 3,0 - DIGIT - WRITE ONLY
TO DIAL, use B0A, # 10 for 0

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Platoon is set in the jungles of Vietnam and starts you as a new young recruit in a *Platoon* of five that's deep in enemy territory. You are totally unprepared for action and are destined to become another casualty statistic. In your early games this will happen quickly in the jungle or the village but later you may even survive to tackle the tunnel network and bunker of part two and then the second jungle and finally a duel for a flashlight and cover just minutes before a napalm air raid.

The three sections are loaded in separately from tape and



PLATOON

you must survive one to start the next. The game begins as you and your patrol of five enter a Vietnamese jungle.

The jungle forms a sideways scrolling maze that patrol must enter to find a pack of explosives that have been left by a previous patrol. Although there are five in the patrol you can only control one at a time but can swap freely between them by selecting them from a menu accessed by pressing a function key. Each man begins the game with a full complement of machine gun bullets and a bagful of grenades. As they are shot at and blown up they will suffer hits and if they get four hits then they're reported as being killed in action.

Deep in the jungle you'll find some explosives that you will need later and you may even find some medical supplies to heal hits and ammunition and grenades on the corpses you create. When you find a bridge you must be quick to get across it, set explosives and destroy it before a large enemy patrol crosses and wipes you out. Then it's on into the jungle again as you search for a village. Now you must be careful not to shoot innocent villagers which will damage your morale and could end your game. In the village you must search the huts for a torch, map and explosive that leads and equips you for part two.

In part two you are on your own as you explore a tunnel network that is mapped out on the right hand side of the screen. The other half of the screen shows your view and you should stay alert ready for enemy soldiers and particularly those that swim under the surface of the water that kill hits, the complex and hazy up to knif's you. If you're quick enough you can shoot them by aiming a cursor and firing.

Apart from death lurking around every corner you will

also find rooms to search that include useful objects such as red cross boxes, flares and a compass that are protected by booby trapped boxes. When and if you emerge from the tunnel you find yourself in a flashlight but your plans to rest until morning are thwarted by an enemy attack. You do have a machine gun but will need all your flares to light up the enemy or you'll be reduced to lucky shots in the dark.

As morning dawns and part three loads you see Sergeant Elias, who led your patrol, panned down in a hail of enemy fire and discover that Sergeant Barnes is indirectly responsible for his death by not helping him. What's left of your conscience quickly departs but before you can act a crackle on the radio warns of a napalm raid in just two minutes. The compass that you collected in the tunnel will guide you north and to safety but you'll have to avoid snipers, traps and even hidden mines. If you succeed you come face to face with Sergeant Barnes. He is in a flashlight armed with a machine gun and grenade and he's trying to kill you – you must avoid his fire and score five direct grenade hits to kill him and claim the flashlight before the air raid strikes.

Each stage of this combat game will demand your skill and reactions are at their best otherwise you'll end up a statistic instead of a high score. **T.H.**

Trackline:

Title: *Platoon*. Supplier: Ocean Software, 6, Central Street, Manchester, M2 1AN. Tel: 061-832 6621. Machine: C64. Price: £8.95 (C6) £12.95 (other).

Teacher's Pet

For the musically minded take a look at the new package specifically created for music students

By Margaret Webb



There have been very few new educational programs about recently and so it was a nice surprise to receive a parcel of four disks from Perfect Fourth Software. These were the component parts of a package designed to help students of music to pass the aural part of their examinations. Hence the title of "Aural".

Each package consisted of a cassette or disk, an instruction book, a booklet about the Associated Board of the Royal Schools of Music Examinations and a music student's practice diary. There are four packages, the first one dealing with Grades 1 and 2. Grade 1 consists of six sections which are:

Scale Awareness - this is an introductory lesson to remind the user how the major chord sounds. The chord is played and the notes, octave name and the number of the note in relation to the key note are shown simultaneously.

Sing a note - in this section the user practices singing single notes in tune.

Name a note - this helps the user practice recognising a played note. A key chord is played first, and then the key note followed by the test note. The user has to say which note the test note was.

Clap a Rhythm - self-explanatory!

Grade 2 uses the same approach but is a little more advanced. In section 2, three notes have to be sung. In section 3 you also have to name a note but this time with a quicker response. Whether you choose to do section 4 or 5 depends on your singing voice; section 4 is low pitch while section 5 is high. In this test you are given a key note and asked to sing the second, third, fourth or fifth notes of the scale. Section 6 is again clapping a rhythm, but as expected a little more advanced than Grade 1.

Grade 3 has the same components as the first package. The program contains scale singing similar in approach to its equivalent in Grade 2. The additional areas covered include interval singing in which two notes are played and the user is asked to sing either the upper or lower of the notes. In melody singing a key chord is played followed by a four-note melody. The user has to sing the melody aloud getting the rhythm and notes correct.

The Grade 4 package follows very much the same pattern as Grade 3. High or low interval singing is similar to Grade 3 except that you are now asked to name the interval. With melody singing the length of the melody is extended to five notes.

Grade 5 starts with scale recognition. The computer plays as a key chord and key note and tells the user the name of the key (C F or G) and then plays another note. The user has to identify the scale. The other sections are very much as for the other levels. All grades have a further option for practising beating time.

Overall, these packages did not measure up to expectations. The programming didn't really use the full capabilities of the computer. Knowing what games writers can get out of the 64, for example, I thought the search word were very primitive. The manual suggests connection of the computer to a Hi-Fi system - I'm not sure why. The use of graphics, additionally, was limited to the normal character set with bland coloured screens. Although the content is aimed at aural and vocal skills, more attention to use of graphics and presentation would have added to the appeal. Due to the nature of the subject, much must be left to the hobby of the user. The package does little, however, to encourage the user to practice what is probably one of the most difficult parts of the examinations. The dull presentation could, indeed, have the opposite effect.

I asked a friend who has musical qualifications to look at the programs. His comments after testing them all were not favourable. He said that either the standards required for the



grades had been considerably lowered over the years or the programs were not testing the student to an adequate level. His other comment was that any music teacher worth his salt would be

using part of his allotted lesson time for teaching about the aural test and that if he was not, another teacher should be sought. To be fair, these packages are designed to provide practice rather than direct tuition.

Apart from the unattractive presentation, the price of the packages may be against them, although it is refreshing to see a company which doesn't charge an excessive surcharge for the disk version.

As I have said in the past, in order to succeed nowadays, software must be well programmed and presented. I suspect that these packages would have been better if a professional programmer had been used with appropriate guidance for the musical educators.

Titleline:

Name: *Aural* Suppliers *Project Four* Software, 11 Hampstead Lane, Boston Col, Brentford, Middx HA3 7JL. Tel: 0447 6311. Prices: Grades 1/2 - £16.65 (tape) £18.45 (disk). Grades 3/4/5 (individual) - £14.85 (tape) £16.65 (disk).

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Making GEOS British



*J*ust about every Commodore owner will have heard of GEOS, the Macintosh-like window environment for the C64. Many magazines, including this one, have expounded upon the ease of control of the program and its ability to make using the C64 much easier. However using GEOS and its associated programs does present some problems to the user. The problems exist quite simply because GEOS is an American program, written by Americans for Americans, with no thought being given to we poor Brits who would like to use the program ourselves.

The programs presented here will allow you to Anglicise some of the GEOS suite of programs. Firstly GEDocs and GEDocs are given a pound sign, an item that they are sorely lacking. By altering the BSW font, Secondly GEDocs is given postcodes, counties and printed labels in a form the 'Great British Postman' will understand instead of zip codes, states and American address labels. It is important to note that these programs are for use with GEOS V1.2 and V1.3. It can not be guaranteed that they will work with any other version.

Getting Going

Before you rush into typing in the programs and altering your disks, a

word of caution. The programs presented here will alter the contents of your GEOS disks, so make sure that you have a couple of back-up copies of your GEOS programs before attempting to alter them. After all a simple typing error could be costly and make your GEOS disk unusable. Two programs are given (see near of the magazine) one for changing the BSW font so that it has a pound sign, the second for altering GEDocs. The programs should be typed in separately and saved to disk before running.

The Works

A simple description of how to use the programs and how they work is given below. An in depth knowledge of how the Commodore disk operating system is needed to understand the program operation fully. I have therefore kept the program explanation extremely simple. Should you be interested in finding out more about your drive then try reading 'The Anatomy of the 1941 disk drive'.

BSW UK

In order to give the user access to a pound sign the program BSW UK simply alters the very last character in

*Have you ever wished that
GEOS had a pound sign?*

*Have you ever wished that
GEDocs was set up for
British addresses?*

We'll read on

By Brian Sedghear

the GEOS character set to the required sign. In order to alter your character set simply LOAD the program given here, put your GEOS disk in the drive and RUN the program. The program will do the rest and tell you of any errors along the way. When the program ends it will boot GEOS if you require. If you do make a mistake or an error occurs then follow the "restoring your original GEOS disk" section in your GEOS instruction manual.

New Signs

To access the pound sign when in GEOS simply hold down the Commodore sign and press the * key.

There are a number of other characters available in GEOS that aren't mentioned in the manual. These are accessed by holding down the Commodore key together with another key.

@ will give an underline.
will give a closing " .
space-arrow will give a vertical line.
/ will give a slash in the opposite direction.
Give / and / a try yourself.

Program Description

15	Initials Drive
20	Open GEOS-format file
25-80	Searches GEOS kernel file for string BLOCK-LOAD command
85	Sets block pointer to correct byte in block.
100-140	Installs pound sign on disk.
140-155	Informs user of successful operation
160-175	Reboot GEOS
200-205	Check for disk errors.

GEODex UK OK!

The program to change the ZIP,CITY, Americanized version of GEODex into more meaningful English is very similar in operation to the previous program. GEODEx UK should be typed in as a normal Basic program, having referred to the LISTINGS article first. Make sure that you SAVE this program before you attempt to RUN it.

When you are ready to make the alterations to your GEODex disk, LOAD the program GEODEx UK but don't RUN it.

Place your GEODex disk in your drive and then RUN the program. Your GEODex disk will then be altered, this will take a couple of minutes. You will be notified when the program has finished.

GEODEx UK works by changing the parameters for the window layout and printer format inside the GEODex file.

The Basic program works in exactly the same way as the BSW UK program except that it alters one position in the file, alters it and then moves on to another position in the file and alters that.

The first alteration changes the window layout parameters. The second alteration (405-409) is made to the printed section of the program.

GEODEx UK and BSW UK can not be guaranteed to work with all versions of GEOS and GEODex, so therefore stress the importance of making sure that your disks are backed up before attempting to use any of the programs presented here. Your Commodore will not be held responsible for anyone corrupting their disks.

See listing on page 82

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Jinxter

Jinxter is Magreth Scribble's follow-up to *The Pawn* and *Grail of Thieves*, games that have come to be much respected by adventure gamers, largely because of their presentation and performance on 16-bit machines such as the Amiga and, yes... the Atari ST.

Like Infocom, a company that MS takes after in many ways, this game is top on packaging. Besides two disks, it comes complete with some curious accessories... documents. Besides a quick guide to some of the important commands, a copy of the *Hopage Independent Guardian*, a spoof newspaper and a Department of Guardians Internal Memo.

In the middle of all this verbiage, the keyword 'wessammy' looms large (that's enough about wessammy - ED). This ambiguous word covers a lot of what you might want to know about the game, but as far as your intrepid reviewer can make out, and mark you I really don't see the significance of the diverse sandwiches, the game has something to do with a lost bracelet.

The bracelet in question, it seems, is the much-coveted *Bracelet of Turan*, a fabled artefact to the people of Aquitania, similar as it is capable of increasing their previously meagre store of luck. Turan the magician, before departing this mortal coil, left the bracelet in the not-so-adorable hands of the mischievous Green Witches, and appointed a bunch of characters with godlike powers, who also happened to be grumpy, intricate and lovers of obscure sandwiches to administer the supply of luck to the people of Aquitania.

Sadly, however, an anti-bracelet spell has been concocted by one of the witches, and an uncertain number of clones (for it is a clone bracelet) hanging from the bracelets have gone missing. Without the clones the device will not function. The role of the poor unsuspecting mortal who picks up the job of finding all the bits is to roll back the power of the witches and restore luck to the kingdom.

Sounds like a hideously dull search-and-magic plot, doesn't it? In fact *Jinxter* doesn't quite work that way. At the start of the game you find yourself on the way home on a crowded and smelly bus. The social realism lasts quite a long time too. By my 212th move I still hadn't encountered anything more magic than a few rather valid hallucinations - I've encountered worse after a few jars of Special Brew.

The fact is that this game really rather resembles



Hitchhiker's Guide to The Galaxy - the humour is distinctly Adamsque with a dash of Monty Python. A little derivative, but fun in places. My favourite fictional beast, the dog who breathes microscopic space flets, even gets a part.

You can get a long way into *Jinxter* before encountering any real problems. This makes the game very good as a self-introduction to adventure games for newcomers to the genre. An excellent idea of Magreth Scribble is to provide a hint list in code in the documentation. There are four or five hints provided for each puzzle, in increasing order of complexity. To use the facility, you simply have to type a list of double-letter combinations into the computer, and you are told what to do. Unfortunately, for those who don't want to be told, the title of each problem forms a hint in itself.

Which is where any quibbles I have come in. Experienced adventurers may find this game a little slow to get off the ground, besides being a bit of a give-away in places. For a start it accesses the disk a lot - if you're using a C64 that gives you a lot of coffee breaks. And when I was a lot, I mean a lot - the game program reads a disk read just to give you an inventory list or do a bit of parsing. Doubtless, this was a great idea when implemented on a 16-bitset, but it doesn't cut the mustard on a C64. At least you can turn the graphics off - they're pretty but uninformative.

It's also a bit porous in places - I have little patience with games that have you continuously UNLOCKING things, then OPENING things, then EXAMINING things to see what's inside. It doesn't give much of a puzzle, and it's quite reasonable, as some games do, to assume that UNLOCK means OPEN as well, and some of them even throw in a description of the contents as well. Not *Jinxter* - as if there wasn't enough of all this unlocking etc, the most unimportant of doors in this game can blow shut all by itself, opening you to, of course, OPEN it again (yawn city!).

Still, the puzzle's pretty good, the game picks up later, and the packaging and documentation are great. The worst problem is that slow disk intermission. For that, I've topped a few points off my rating.

R.F.

Tweezer:

Title: *Jinxter*. *Supplier:* *Firebird/Magreth Scribble*. *Wholesale House:* *Upper St Martin's Lane, London WC2M 9PL. Tel: 01-779 6771. Marketing:* C64. *Price:* £19.95 (disk only).



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THE FINAL CARTRIDGE III

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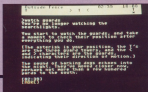
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Border Zone



Washington and Moscow are the capitals of the superpowers but the Cold War is fought in Eastern Block countries like Fröbia and the adjacent neutral state of Litzenburg. This is the setting for Infocom's *Border Zone*, a spy thriller in which you play three separate parts in three separate but linked adventures.

The game begins on the night train from Fröbia to Litzenburg. You are a tired businessman and not enjoying the bumpy journey at all, simply glad to be out from behind the iron curtain. You were even lucky enough to get a compartment to yourself but then your luck changes. Suddenly, the compartment door flies open and a man who's obviously been shot in the arm staggers in and gives you a document. Although the document is written entirely on Fröbian you realise it's important and agree to give it to the contact at the next station and fail a plot to assassinate the American ambassador. The agent is soon gone leaving you with a fresh bloodstain on the carpet, a white carnation pinned to your lapel (the sign for the contact) and a document that could get you arrested. You look outside into the train's corridor and see that police are everywhere and a man in a trench coat going from compartment to compartment and he's only three doors away from you!

Whatever, you are going to do you'd better do it fast as if your arse suspicion you won't be allowed off the train to hand the document to the contact who you don't know who speaks a language you don't understand. If you solve that bit and have listened carefully to the agent and read the contact you can warn the authorities of the impending assassination attempt and then climb back on the train that will take you to safety.

In part two, you are once again travelling towards the border but this time you're the American agent and you're just jumped off the train. You're stunned, wounded, cold and already you can hear packs of dogs looking for you and even the sound of an approaching car. You decide the chance that the car passengers will help you and dive from the safety of the woods and see a hat. As you approach the hat the car pulls up and guards climb out and if they don't see and arrest you then warn the hat's occupant that you're on the loose. This leaves you cold, wounded, hunted and alone.

The border lies just to the North but before you get there

you will have to avoid the guards and dogs and your state of health before you work out how to avoid the searchlights, border guards and forces of the border that lies between you and safety.

In chapter three you are a Russian double agent sent by the KGB to look after the assassination attempt of the visiting American ambassador. You're there to ensure that all goes well although the KGB has found an Iranian to pull the trigger and deflect the blame from Moscow.

It is now 11:00 and you're standing in the square in the Litzenburg border town of Givonia. In under five minutes the Ambassador will speak in the square and the assassin will strike. Unfortunately, you are a double agent and must stop the sniper! You might get some help from your KGB contact Rinko who owns an antique shop but again you're on your own. You must stop the assassination without alarming the police, the Russians or being caught by the American agents who you have just spotted in the cafe. If he sees you he'll shoot and ask questions later. The crushing conclusion to the game is a desperate race against time in which you must save the ambassador without blowing your cover.

To help you in your three missions the game disk is accompanied by the usual superb Infocom packaging which includes a map of the Border Zone, a monthbook from the Fröbian railways, a Fröbian tourist guide and phrase book and a business card from Rinko's antique shop.

Border Zone is packed with the Infocom style text descriptions that pile on the atmosphere and tension which is enhanced as this is the first real time Infocom adventure. A clock at the top of the screen ticks the minutes by that could bring the man in the trenchcoat closer, the guards and their dogs nearer or the assassin finger to the trigger.

It's not as difficult as some other Infocom adventures and also includes on-line hints that could guide you to the solutions (only use these if you're absolutely desperate). A tense spy thriller which casts you in three major parts.

141

Available

Title: Border Zone. Supplier: Infocom/Adventure, 21 Paul Street, Hempstead, London N83 2PS. Tel: 01-493 1201. Machine: C64. Price: £39.99 (disk only).

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The ICPUG Column

The third column in a regular series of ICPUG - Britain's biggest independent Commodore user group.

By Tim Annot

In my last column I talked about data transfer between machines - specifically the 64/128 and the Amiga - using asynchronous RS232 and Kermit or Amodem file transfer protocols. Not long after I wrote it, I had a phone call from an ICPUG member who was trying to do exactly that, except he was using the parallel over port on the 64 hooked up to the parallel printer port on the Amiga.

Thinking about it, this is not an unreasonable way to go about it, and it's certainly cheaper than buying an RS232 interface for the 64, especially if you're at the stage of transferring files to a new machine; you are likely to be in imminent danger of selling the old one. There is a problem though. The parallel printer (PRT) on the Amiga, and indeed on any PC, is an output device only. It is easy to send data from the new computer to the old one but not vice versa.

By a strange coincidence, the Amiga's general I/O chips (83500) are register compatible with the 6326 on a 64. Both are called CIA's! Thus, we are in a position to bypass the built-in device drivers and program the hardware directly. In fact from BASIC, the code is pretty much identical for both machines - only the addresses have been changed to protect the innocent.

Hack, Hack ...

Now, what I am proposing here is, roughly, strictly speaking, since the multi-tasking rationale behind Amiga strongly dissuades us from hacking the hardware directly - what if some other task legally tries to use PRT? OK, I plead guilty here, but needs must, etc., and what Amiga DOS won't do... Just

64 Address	64 Register Function	Reg. Name	Amiga Register Function	Amiga Address
\$D000	SERIAL BUS (HRSK I/O)	PRA	DISK CONTROL + MISC I/O	\$001000
\$D080	USER PORT (D0-D7) (+RS-232)	PRB	PARALLEL PRINT (H D0-D7)	\$001800
\$D000	DATA DIRECTION (0 - INPUT)	DDRA	DATA DIRECTION (0 - INPUT)	\$001200
\$D004	TIMER A	TALO	TIMER A	\$001400
\$D008	TIMER B	TALB	TIMER B	\$001600
\$D00C		TBHD		\$001800
\$D000		(TODST)	EVENT	\$001000
\$D008		(TODS)		\$001800
\$D00A		(TODSM)		\$001A00
\$D000		(TODCK)	No Connect	\$001000
\$D00C	Serial Data Register	SDR	Serial Data Register	\$001C00
\$D00E	Interrupt Control	ICR	Interrupt Control	\$001D00
\$D00E	Control Regs	CRA	Control Regs	\$001E00
\$D00E		CRB		\$001F00

6326 (C84) and 6320 (Amiga) Register Map

make sure nothing else accesses the printer while transferring your files.

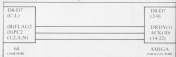
The actual programs... well, I'll leave you to write them for yourselves, but I will provide a wiring diagram for the two parallel ports, and the relevant register maps.

Next time I'll talk about ICPUG at the PCW show, and how we were able to access Compuart without using a

64 128 or Commodore modem. See you on the 64 circuit.

For further information on ICPUG contact: Jack B. Cohen, Membership Secretary, 36 Beaconsfield Road, Newbury Road, Wood, Essex RG2 3EP.

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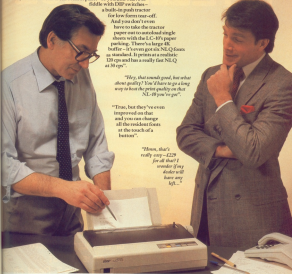
"Well, there's the Star front control panel—so you don't have to fiddle with COP windows—a built-in push tractor for low forms tear-off. And you don't even have to take the tractor paper out to reload single sheets with the LC-10's paper parking. There's a large 48 leaf tray—it's even got six NLQ forms as standard. It prints at a resolution of 120 cps and has a really fast NLQ at 30 cps."

"Oh really—like what?"

"They, that sounds good, but what about quality? You'd have to go a long way to lose the print quality on that LC-10 you've got."

"True, but they've even improved on that and you can change all the resident fonts at the touch of a button."

"Hm, that's really nice—£229 for all that? I wonder if my dealer will have any left..."



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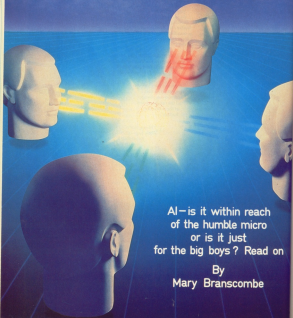
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ARTIFICIAL INTELLIGENCE



AI— is it within reach
of the humble micro
or is it just
for the big boys? Read on

By
Mary Branscombe

The problem with Artificial Intelligence (or AI as it is also known) is that it means a great many things to different people - certainly our demands on an AI system are likely to change as our conception of AI becomes more definite (or at least, less hazy!).

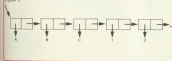
As a result, I have decided to concentrate on one particular language - LISP - the language central to the whole development of Artificial Intelligence and, more recently, as a core to the latest fourth generation languages - 4GLs for short. Of course there have been examples of other languages ideally suited for AI applications - namely Micro PROLOG and even operating systems such as SmallTalk for VAX and PDP computers, but these are derivative, and can be seen as having their roots firmly embedded in LISP.

LISP is a language of constants. As it is one of the first "academic" languages it is still looking forward, and because of its history as a good expert system generator, it has found itself reinvigorated in the world of AI.

LISP has risen in popularity since its completion as a full mainstream compiler back in the seventies. Due to large amounts of money being poured into the design of a fifth generation computer, it is likely that within the next five years we will all be as familiar with an expert system as we are with the microprocessor today. Already such commercial applications of AI research are in common use today, helping out on the factory floor, taking the strain and tedious from everyday working at a steel rolling mill as it controls the vital combination of air and heat.

A doctor has examined his X-ray working knowledge of brain growths in an expert system written using LISP as a front and processing package to analyse brain defects from a brain scan.

Figure 1



This sequence diagram of a typical sequential path written in LISP. This gives the heart of many list programs.

The applications in AI are all around us, and like the so-called "oilcrisis revolution", the acceptance of AI is taking place very quietly, not behind our backs, but right under our noses.

LISP on a Micro

So where do micro based LISP implementations come into all of this? And more to the point, what possible impact can a microcomputer based version of the language do in a field of computer science rapidly gaining momentum? The answer is, quite a lot.

In order to look at AI, we have to look at the way we consider the outside world, the way we consider things that possess "intelligence" - one person's view of intelligence is likely to be directly at odds with another view. Some people think that the computer is "intelligent" when it plays a move in a game of chess, other people think such an approach is worse than morose, but the fact is, it is still possible to program a computer to beat a world master at his own game!

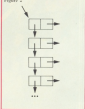
Micro PROLOG is another language used in AI. It's a language designed to work on the same programming structures as LISP, that is using a system of logic commonly termed as predicate logic, but whereas micro PROLOG is better suited to the logical programming concepts we have grown to know and love in languages, man shies to verbs such as Pascal and C++ LISP has taken a radical new angle on the subject, one which has tremendous applications in the world of AI, and that is in "symbol manipulation".

It is every intelligent people's opinion that the one thing that makes us intelligent, is our ability to absorb symbols, find a common factor, and represent that symbol in another way. That is known as learning! When we get to the stage whereby we can make

assumptions such as "the sun sets in the west" and so on, we are beginning to rely on some data being fed to us, which we absorb and can postulate such theories as "with the sun, so the earth rotates around the other".

This is called "predicate learning" and is one of the greatest stumbling blocks in the world of computer science, because the next step we take will force our line of research in one direction or another. In order to achieve the "intelligent machine" we must make the right choice. Do we assume that "predicate learning" processes are achieved by a strict order by deductive processes (our reasoning and learning is made possible by a series of questions to which we are given inputs). On the other hand do we assume that the ability to manipulate huge quantities of symbols and repackage that information in another way is indicative of "intelligence".

Figure 2



Another concept in that of data items - arrays of information stored and retrieved in such a way that makes it ideal for use in databases and expert systems - nothing more than glorified statistics.

Quite a Problem

LISP is a computer language dedicated to symbol manipulation. It has a marginal ability to display alphanumeric characters and no doubt somebody could write an arcade game using the language, but the main strength of LISP is its ability to process large streams of data.

Physical Bodies

LISP is totally unlike BASIC in that it works on this series of predicates,

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which is used by many of the new artificial intelligence languages, namely PROLOG, by typing in:

```
COLOURS
(YRED WHITE BLUE)
```

LISP will reply by returning the literal data given which will be COLOURS and (YRED WHITE BLUE), however if you took away the single quote symbol, the LISP interpreter will return the error message UNDEFINED. You can give a variable a name by typing in a variant using a command called SETQ, this gives a variable a value, a bit like the LET statement in BASIC.

```
SETQ COLOURS (YRED WHITE BLUE)
```

As can be seen, the value to be stored in the variable can be either a literal expression, (preceded by a quote mark) or a reference to a LISP function (known as a "command" or "key word" in BASIC). After entering the name of a variable without a quote mark the value assigned by the SETQ statement will be produced.

As with micro-PROLOG, LISP requires a completely new approach to the way we program. To this extent LISP and micro-PROLOG share many similarities, and even a few more in the language constructs itself, but we have to move away from the "sequential flow" that the flowchart has instilled in our programming ideologies and inferre being continued in programming languages such as BASIC, COMAL and the like.

Consider a list of information: it consists of a number of items, each of which, except the last, has a successor. LISP wishes to treat lists as a class of objects which can be referred to in a uniform way, irrespective of their length. The idea that lists can be traversed by stepping along them one element at a time helps greatly.

LISP also allows identifiers and numbers to be mixed freely with lists. It is a means in itself of handling everything via pointers.

In the case of lists, these pointers will identify one individual item of data, called a cell; each cell of which contains another pointer. The left hand pointer first in the left leads to the first element in the stored list, while the right hand one points to the remainder. So for the list (ABC12...) we get the picture in figure one. Such lists can be organized into sub lists of arbitrary depths, such

as the illustration in figure two.

Now it is probably clear why LISP is such a good general purpose database generating language, as it has nearly all of the functions and data structures inherent in a database built in to the structure of the language.

Tests and Comparisons

The ability to define a function so that, by means of a simple call, structured information may be built, stored or retrieved, or arithmetic performed on an arbitrary piece of data, is a common feature of LISP. However, for more interesting programs can be produced once functions are written capable of using what some people might call

conjunction with conditional expressions built up using the special function COND. The general form of such expressions are:

```
(COND)
(predicate 1 expression 1)
(predicate 2 expression 2)
...
(T final expression)
```

There can be as many, or as few predicate-expression pairs as required.

When LISP finds a COND expression, it starts evaluating the given predicates in order. The value it returns is that of the expression which is paired with the first predicate to yield a "true" (i.e. the first expression to be retained with a non NIL value).



"intelligence", considering argument data from a function, and making decisions about what to do next on the basis of the functions findings. In other words LISP needs to make tests on and comparisons between data.

The most common tests, EQ, ATOM and NULL return values which represent the boolean quantities "true" and "false". In Acornsoft LISP, NIL is used to represent "false", as well as the empty list as each of a data structure diagram. "True" is considered to be any situation where the data returned from a function is not "false", thus we can use the word T to represent this quantity, (likewise F exists for its "False" counterpart).

LISP functions that are thought of as returning "true" values are known as predicates. Their main use is in

In the previous example, the constant T is used as a final predicate. Since this always has the value "true", the over responding final expression can be seen as a default. The result to be retained in all of the other predicates is therefore "false". Thus, expressed without the brackets, the conditional form can be read as:

```
IF predicate 1 is "true"
THEN return the value of
expression 1
ELSE IF predicate 2 is "true"
...
ELSE return value of final
expression.
```

When LISP requires composite predicates, it can build them up using AND and OR. Each of these functions can cope with an arbitrary number of arguments. They evaluate these arguments one at a time until the

normal rules of logic allow them to return a result. Thus AND will evaluate arguments until it reaches the end of the list (and returns T) or until it finds that one of its arguments evaluates to NIL.

OR will stop evaluating and return T as soon as it finds a non-NIL argument. Phases of LISP code which seem to require a complex nest structure of COND, AND, OR and NOT are usually best rewritten as groups of smaller functions.

The LISP System on a Micro

When you write a number of functions using LISP you are bound to make mistakes, after all that is the fun connected with computer programming. When LISP encounters an error, a number of things will occur.

Your answers will either end up making total nonsense (the worst kind of error), or, if you're lucky, you will be greeted with an error message, and a confusing collection and list of LISP expressions.

This list is called a "back trace" and is supposed to help you with debugging, although some mainstream LISP systems use the back trace to make educated "guesses" as to what the error is, and where it is most likely to be.

One of the first actions upon getting an error message, is to check whether the error really is an error, and not just an unexpected result, an extremely cautious human misinterpretation on behalf of the computer.

Once you have traced the logic of the program by using the data structure diagrams (as all things center round the data, the integrity of the data is the second thing to be considered as faulty. The fun really begins, and where LISP, thankfully enough afterwards at being able to help in isolating an error, as you can examine all of the quantities ever passed in LISP functions and all the values that can ever get returned as results can be read and printed.

The only time when you cannot examine the integrity of the function is when problems occur with function entry points and with re-entrant structures such as breaking out of a loop structure by direct means, to hit like hitting a GOTO inside a FOR-NEXT loop.

When all else fails, it is time to pull in the heavy rods, in the form of a function called TRACE. This can be used to see how values get passed

between functions in a complex calculation. Again, the object of using it is to isolate a single function returning incorrect results, and to exhibit arguments which lead to bad behavior.

If the bad function is a simple mistake, then it will be easy to correct the error, save the program and try again. However, if all else fails, then all that is left open to the programmer is a long night sitting over a dry run sheet and a lot of paper.

LISP and AI

AI consists of a number of apparently discrete areas, some of which have been listed at One in particular was the analysis of data trees and a simple type of game. This can be taken further. Imagine what happens as the tree grows bigger, the number of branches so great that they start to intersect, to produce a loop in the tree structure. This latest idea is used in the "mouse concept" whereby a small robot is placed in a maze, and is quite literally left alone to learn about its new environment.

In this example the mouse is left to make a pathway in order to get from one part of a maze to another. If this seems pretty futile, examining the concepts of examining the possible movements. This same concept has been used in databases and even in a special version of chess, to find the quickest way of getting from point A to B. This could be used to develop fast search operations. LISP has been used to write wordprocessors and screen editors in its past.

A famous LISP program, written mainly as a joke has become a notorious addition to any LISP system and is great for breaking the ice at parties! Called ELIZA, it is a simple question and answer session between computer and its operator, sometimes the results can be stunning:

Operator:	My father hated me.
Computer:	Tell me more about your family.
Operator:	I remember my unhappy childhood.
Computer:	Do you often think of your unhappy childhood?
Operator:	No, I can't.
Computer:	Tell me why you can't.

This is a section from a typical LISP dialogue, and as you can see, the operator is already opening up his heart to what is essentially a plastic bear with a TV on top of it!

I would be surprised if ELIZA has

any therapeutic value, especially as the operator eventually gets annoyed at the lack of feedback, just questions and no answers; but to begin with, we are willing to tell all, to convince ourselves that there is a compassionate, thinking behind the computer screen and the results tell us a lot more about our demands from AI than what we originally think.

I hope that this proves my last point. The fact that AI also relies on the fact that we are willing to attribute intelligence to a series of rules and statements for at least some of the time. Regardless of how a piece of software is written, if it at least gives the appearance of behaving intelligently, that is enough for some.

LISP will not turn your computer into a silicon prodigy, nor will it even hope to compete with complex applications such as sentence and word structure analysis (as is being researched by the Lotus corporation for a "constant checker" to check sentence structure for bad use of the English language) but what LISP will allow is some fairly comprehensive database and list processing programs to be written.

In addition to this, LISP is perfectly capable of supporting a full parser for direct text entry, so it may find itself applications in expert systems and simulation and modeling programs that require aspects of the real world to be simulated. Again LISP is the ideal front end for this as nearly 70 percent of the functions deal exclusively with conditional comparisons.

I have seen a chess program being written using LISP. Although this is purely an exercise, it should give an indication as to just how serious applications can be written using LISP.

For more down to earth applications - or at least those which are more suited to the micro with LISP are for writing computer adventures, and with its advanced features (found normally only on compilers such as "Golden Common LISP" for the IBM PC and MS-DOS machines, or MAC LISP for the Macintosh, or even Cambridge LISP for generic 32-bit processors) a good deal more than just fun and games are possible. Not to mention educational establishments that are willing to teach microcomputer based, program programming structures in LISP to College and University students.

First Steps

Clear thinking and cleanliness form the key to creating a suitable environment for learning about your computer

By Norman Doyle



The normal reaction to change is resistance - there's a habit in everyone just bursting to get out. Change, not necessarily progress, is inevitable and the machines of the New Age roll on relentlessly.

A major stumbling block to the learner is the fact that once initiated into the mysteries of the new, the experts proceed to slam the door and hit it with torrents of jargon. Familiar everyday operations gain strange and air-games, the commonplace becomes ritualized into ceremony. Take the simple act of turning on the computer. If it were a television or a light it would simply be switched on, but computers are powered up, booted or placed into operational mode. Like the cover ornament of a temple, a veil of terminology hides the holy of holies from the common man.

Fear and curiosity are the driving forces of change and computer technologists have followed the tried and tested route to exclusivity by relying on technical and thick volumes of computerpeak to bar the path to the initiated. Even as a technically minded person it took me many years to pluck up the courage to delve into computers and in immediate confusion descended.

By way of a tunnel into this great bazaar of the computer age this series of articles will take you back to the very basics and drag you kicking and screaming into this brave new world.

Presumably, you have already taken the first step of buying a computer. Probably the choice was made principally on the basis of financial restraints and ego. The machine would be accompanied by an

'easy' introduction to computers but the volumes of introductory basics available belie the cry that one book is all you need.

Inside the machine there are dozens of delicate electronic circuits but few books deal with routine maintenance. The current fashion for matt finished cream and grey plastics means that it is not long before your shiny, new acquisition becomes a grubby, roller stained dust trap. A quick flick of a leather duster may remove the surface dust but the computer is riddled with holes for ventilation, sockets and spaces between the keyboard buttons which all let in dust.

If you've never had the urge to examine the innards of your Commodore I suggest that you do so at the very least, let it cool if it's been used recently, and carefully remove the lid. What will you see? Dust.

At least once a year you should give your computer a spring clean. The circuits operate on very low voltages and dust can form an extra electrical pathway which may eventually lead to trouble. Circuits are delicate and coated in a protective skin of lacquer. This jacket is just like the Teflon on a new non-stick pan; rub too hard and it won't last long.

The best way to remove dust is to use a puff of air such as the type sold in most photographic stores. The use of a compressed air aerosol can be useful for inaccessible areas but take care not to spray directly onto the circuit board. The compressed gas often liquefies under pressure and a damaging spray of ice cold liquid can

emerge if the container is held at the wrong angle. Always follow the instructions given on the can and select an aerosol with a flexible nozzle extension to avoid trouble.

The outside of the casing provides its own problems. Even the cleanest hands produce protective oils and grease which can prove stubborn to remove. Used frequently, a cloth dampened in soapy water will remove most of these stains. Make absolutely sure that the cloth is only damp to the touch if any water leaks inside to the circuits you may end up with a clean but inoperative machine. Stubborn stains can be removed with a non-abrasive cream but again ensure that only the absolute minimum is applied and clean it off with a dry or slightly damp cloth.

The connection ports (sockets) provide their own problems. If you don't have a fixed work area where the computer system can be permanently connected, the ports will receive more than their fair share of wear and tear. Even under perfect conditions the use of cartridges, modems and other equipment will result in the gradual wearing down of the connector strips. Always ensure that these are clean and grease free because any grit will aggravate the problem. The best applications for this purpose is methylated spirits or even lighter fuel. Both of these are highly flammable liquids and must be kept away from naked flames.

The C18 and Plus/4 have their own problems because all the connectors have slimy mineralised EPN plugs. The fine pins can shear off if too much force is applied and constant plugging in and unplugging increases the

possibility of damage. Once inserted they hold very well and I would recommend leaving everything connected whenever possible. NEVER force one of these plugs. If it won't go in easily, examine it carefully and gently straighten any pins which are misaligned but be warned, too much force will easily snap them off.

Peripheral Perfection

Cassette recorders and disk drives are both liable to additional problems due to the dirty medium which they use - magnetic coated film - and because they produce temporary magnetic fields in the presence of magnetisable materials.

The cassette recorder pulls a long strip of magnetic oxide across a small recording head with an even smaller slit in it. As the tape moves across this strip an ever changing magnetic field affects the particles on the tape. The magnetic forces are created by electrical impulses from the computer. If you consider each particle to be like a small magnet, it is magnetised in the direction of the magnetic field at the

particular instant it crosses the gap. The field is changing all the time and the faster the tape passes the head, the more particles are affected and the more detailed the transferred information will be. With many thousands of particles the field is 'mapped' accurately and when the tape passes across the head in play mode these patterns excite the circuitry to recreate the original electrical impulses which created them.

To get a good transfer the tape must be in close contact with the head. This causes wear on both the head and the tape resulting in oxide being dropped on the head and seriously affecting the small magnetic fields. This is more serious when reading the tape back in because the recording process is inefficient and the stored magnetic field is many times weaker than that which created it. The presence of the particles creates 'noise' (stray magnetic effects) and reading the tape can be like listening to a whisper in a noisy factory.

Head cleaning tapes should be used frequently to have any effect. Leave it too long and you'll have to use a

solvent to remove the stubborn accumulations of oxide. Cheaper tapes shed oxide more readily so forking out the extra few pence for quality can save money and time in the long run.

Head alignment is also crucial but is now easily remedied with a good head alignment kit. Azimuth alignment is just the jargon term for this and the problem is caused because the head only has to move by a fraction of an inch to affect the tape's legibility - it's like trying to understand a book by reading diagonally across the page.

The same problems apply to disk drives and the solution is the accumulation of oxides is similar to the one for cassette problems that alignment is really a job for the professional with an oscilloscope and not one to be undertaken under any circumstances. Head alignment kits are available but can cause more problems than they solve in the wrong hands.

Dust, smoke and carelessness are, and always have been, the greatest cause of computer faults. Cleanliness and thoughtfulness will set the scene for carefree computing.

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Sonus MIDI Music

When many companies seem to be forsaking the music potential of the Commodore 64 for the bright lights of the Atari ST, it's encouraging to find a company like Sonus with more Commodore 64/II products than all the other companies put together.

By Ian Wang

Sonus are a relatively new company in the UK, having set up offices here just too late to get a stall at last year's British Music Fair. They are a well known and much respected name in America, and they have no less than 18 MIDI programs and two MIDI interfaces for the Commodore.

The Hardware

Let's get straight down to business and look at the hardware side of any MIDI set-up - the Interface. Sonus's Standard MIDI Interface has a MIDI In and two MIDI Outs. It's well constructed and housed in a sturdy black plastic case which plugs into the Cartridge Port. Sonus's other Interface has tape sync. For serious recording with a multi-track tape recorder you will need some sort of sync to tape facility to allow you to overdub a number of parts onto tape while maintaining sync with each other.

When you have more than two pieces of MIDI equipment you may need to consider a Thru Box such as Sonus's 2 In 8 Out MTR. It can help make more sense of all those MIDI connections.

The manuals say Sonus's software will run with Service, Passport, Formula (not generally available in the UK) and Sequential MIDI Interfaces and, in fact it should also run with Data, S.H.L., Art Impass and Steinberg models, too, but it's best to check to make sure.

Super Sequencer

We'll begin with the biggy - the Super Sequencer. There are two versions



available, one for the 64 and one for the 128. The 128 version takes advantage of the extra memory and it doesn't cost a penny more. All the other Sonus programs will work on the 128 or 64 mode.

Super Sequencer operates very much like an audio tape recorder, a method of working with which most musicians are familiar. They are Play, Record, Fast Forward and Rewind controls. You can create up to eight tracks of 16 sequences which can be chained together to form a song, and up to four songs can be stored in memory at once although they can only be made up from the one set of 16 sequences.

There is one main screen in which all the recording and editing takes place and another screen in which songs are constructed. Along the bottom of the screen are four menu

options which are selected with the function keys. These have up to four levels depending on whether you press the function key alone, with Shift, CTRL or Shift and CTRL. It can appear overwhelming at first but they are arranged fairly logically and a little use soon breeds familiarity. I would have preferred to be able to access all the functions with just one hand, though.

Super Sequencer lets you select three PPQN (pulses per quarter note) values which give different recording resolutions (although the smaller values will usually be quite adequate). You can drive a drum machine via the MIDI Clock on the sequencer can be driven by an external clock.

Super Sequencer has virtually every facility you would expect to find in a professional MIDI sequencer program. The exact lengths of

sequences are easy to set and each sequence can have a different tempo. Tracks and sequences can be named—very useful—and given individual channel and velocity settings. You can also clear out unwanted MIDI data.

Curves can be used to set auto punch-in and out points, and tracks can be bounced down to create a backup track or to free a track so more recording can be done.

The Track Menu features Auto Correction with a resolution of up to 16-note triplets. Tracks can be transposed and shifted back and forward in time to compensate for timing errors.

Sequences can be appended to themselves or other sequences, transposed and shifted. In the song screen, up to 24 sequences can be chained together. Each sequence can be set to repeat up to nine times and given its own transposition and automatic setting. This allows you to change only to play selected tracks in the eight-track sequence.

Other features include Omni Off (so that those synthesizers which always start up in Omni mode), a Scene Manager to tidy up the end of a section and Play Through to allow your master keyboard to play another instrument on a different channel.

There are stop-time facilities, too. The Return key can be programmed to stop the clock on by a set amount and used to move through the recording. It's simple, perhaps not an ideal method, but it's effective.

Super Sequencer even features a



System Exclusive Dump which can save and store drum machine patterns, vocal settings or sample data (although it's doubtful if the Commodore would have enough memory to hold much sample data), providing the equipment manufacturer. It would allow you to save all the necessary information for a song on one disk.

The manual is excellent and explains all the functions clearly. There are so many features, however, that a crib card is included to help you find your way around.

Glass Tracks

The intriguingly named Glass Tracks

is very similar to the Super Sequencer and shares many of its editing, recording and MIDI functions (but not the system Exclusive Dump). Glass Tracks, however, only allows you to construct one 16-beat song made up from eight sequences of eight tracks each. A single sequence can't repeat or be transposed. Altogether Glass Tracks is not as powerful as Sybil as the Super Sequencer but then it is less than half its price and it will comfortably handle many applications.

The screen layout and modification functions operate in the same way and you can swap files between programs. The program disk contains some excellent demos. Glass Tracks would be an ideal program if you didn't want to commit yourself to the price of a Super Sequencer. It, too, has an excellent manual.

Personal Musician

If you're still not convinced that making music with MIDI can be both easy and fun then Sonnet's Personal Musician may be worth looking at. It's a complete package containing easy-to-use software and a MIDI interface plus cables.

It was designed for entry-level users yet still maintains file compatibility with Sonnet's more comprehensive programs. The manual includes 'Introduction to MIDI' and 'Beginner's sections' and the program disk contains a selection of Christmas carols (better late than never) as well as other demo tunes.



MIDI Processor 64

All in all, the Sonus sequencers are excellent programs. The Super Sequencer is certainly the most comprehensive, but it's main omission is the lack of a note editor. Now, such editing involves getting down to the bits and bytes of MIDI data and may not appeal to everyone but it could save a lot of time and trouble if, for example, you needed to correct just one note in an otherwise perfect sequence. Such an error in an audio recording would require a re-take or a patch in and you can use the Super Sequencer's auto patch facilities to do this.

Sonus's MIDI Processor, however, lets you do this and more. It is a stand-alone program but it can load and save sequencer files. It can be used to examine MIDI data and remove unwanted program changes, pitch and mod wheel data. It can also 'introduce' a process which involves exchanging information on a given channel and putting it on another track.

It has its own mini-sequencer so you can record additional tracks and add them to your piece although its main purpose is to test the results of your edits. The Range Edit feature lets you work on just a range of events rather than a complete track or sequence.

MidITech 64

Sonus describe MidITech as a monitor/system evaluation librarian. It is to MIDI data what an assembler/compiler is to machine code. We're really down among the bits and the bytes in MidITech as most information is displayed in hex which should give computer users less of a headache than musicians.

MidITech can be used as a diagnostic aid to check suspect MIDI data or to edit it. You could, for example, load in a Super Sequencer file, edit note or event information and reuse it. Not the simplest way of doing things, I admit, but it illustrates the potential.

More practically, it can be used to initiate a MIDI dump request from instruments without a manual dump and on there front panel such as Casio's CZ-101. I Dump Requests are included on the program disk.

MidITech also has a 128 byte Trigger Buffer which holds a series of data it must receive before it begins

recording MIDI data. This would be used to start data reception after a certain event had been enabled such as the use of a mod wheel or a program change.

There are selectable MIDI filters, capture Play Through and editing features.

MidITech is a fascinating program, unlike any other MIDI program I've seen. The average - and even the super-average musician may never need to use its facilities as the MIDI Processor should fill their needs. A MIDI technician, however, or data buff will have a field day and someone like's reasoning to know that a program like this exists. You may just need it one day.

Score Track

Most MIDI sequencing programs display the music they record as a series of numbers. They are generally quite easy to read but it's often useful to be able to see the music in traditional notation.

Score Track does just that. In fact, it's a well-contained sequencer program with real-time input. It was written by Gerhard Leupring who wrote C-Lab's programs and it betrays its roots by displaying a C-Lab logo in the edit screen. Operation is with single key commands - as opposed to Sonus's multi-menu system - and it's a very easy program to use.

You can record 64 Patterns each with up to 16 tracks and arrange them into a Song containing up to 256 Pattern Positions. There is a mailing function so the same patterns can be used in different positions with different tracks playing.

The disk contains a converter program so you can load Super Sequencer files. There are facilities such as track copying and freezing, quantisation, transposition, ghost tracks and various delay options to get tracks and drums machines in sync.

Recording takes place in the Song and Pattern screens. To see a track in traditional notation you go to the Edit screen. The music is shown on a treble and bass clef and beneath the staff are options to alter various parameters which affect the display. These include quantisation, minimum note length, legato (overlaid chords forming a single minimal overlapping), staccato (to set the minimum rest length) and

transpose. The screen updates after each keypress and you can see how the alterations affect the music.

Beneath the staff is an event editor which shows the time of the start of the event, the note name and duration if it's a note or any associated parameters if it's not. The cursor on the staff is linked to one in the event editor so you always see how the two fit together.

You can enter, insert and delete notes and events and although you can write a piece directly to the staff (principally by directly inserting notes) if you can find your way around a keyboard you can probably enter a piece just as easily in step-time from the Pattern screen.

The print out is basically a dump of what's on the screen.

Unfortunately, the staff has a range of only four octaves and although notes outside this range are shown in the event editor they appear on the staff as rests and are printed as such.

In spite of its limitations - there is a limit to what you can cram into a 64K, after all - Score Track is a nice program and if you like to see your music in traditional form - as I do - it can be recommended.



Voice Editors

Sonus have a range of voice editors for many of the most popular synthesizers on the market. Voice editors serve three functions. Firstly, as most synths are digital, programming new sounds often requires the adjustment of dozens (possibly hundreds) of numeric parameters. Quite often the only display on the synth is a small LCD which can only show the value of one parameter at a time. With these restrictions, it's not very trying to work out how a sound is constructed.

Software can help by showing all the parameters together on one screen - or several screens if the synth has so many parameters - and by translating some of the numbers into graphics - waveforms and waveform shapes, for example.

Secondly, the voices on most synths are arranged in banks and you will often want to load a selection of voices into a bank in a particular order. Trying to arrange voices in this way on the actual synth can be very hard work indeed but with a computer it's a doddle.

Thirdly, voice editors let you save voice data to disk. The usual method of storage is a plugin RAM pack or a dump to a cassette. In terms of sheer convenience – and a saving in RAM packs – a voice editor can soon pay for itself several times over.

Casio Programmer Librarian

Like Sonus's other programs, their CE/PL (Casio CE Programmer/Librarian) is driven from a series of menus called up with the function keys, Shift and CTRL. The program can store two banks of 16 voices and has an edit buffer. You can load and save voices to and from these, the CE synth and disk. The program's banks are called Cartridges, not to be confused with the CE's RAM cartridge.

You can swap voices from bank to bank and buffer to buffer with the press of a few keys. Some of these swaps are activated from sub-levels of the menu and require three key presses to activate and then a confirmative Y or N so you don't overwrite. You do get used to the system after a while, especially after using the Sonus sequencers but I wonder if a slightly different approach could have made the process simpler.

The Edit screen shows all the numeric parameters at a glance although you have to press Space to swap between DCH and DCO. The layout is not arranged in the same order as the synth or the Casio CE patch charts – and hence the normally accepted method of writing voice parameters – and slight though the difference is, it makes copying patches from charts just that shade more difficult. The data is illustrated purely as numbers – there are no graphs, unfortunately – but, to be fair, although some voice editors have graphs, most don't.

However, once you get the hang of things – and a little familiarity goes a long way – the program can aid programming enormously.

Compared with the price of RAM cartridges, the program cost will quickly be recouped as you can save any number of banks of voices conveniently to disk. The CE/PL disk

contains 10 banks of 16 voices so that's a nice plus. Casio Digital Disks are also available containing 10 more banks of voices and you can buy patch charts from various sources which you can type into the program.

DX-TX Design

If you have a Yamaha DX or TX 3, 216 or 516 synth or expander then the DX-TX Double Banked Librarian & Programmer – to give it its full title – does fit these instruments with the CE/PL, does for the Casio CE synth.

It uses the same sort of function key menu system and displays the parameters numerically over three screens – shared full of parameters these DX/TX things? It can hold two banks of 32 sounds and includes an AB compare feature. The disk contains eight banks of 32 sounds and a DX-TX Digital Disk is available containing over 500 sounds.

FB-01 Design

If you have a Yamaha FB-01 and want to program your own voices then you must fit to some software to do it as the FB-01 lacks the necessary buttons to be programmed by itself.

FB-01 Design retains the Sonus function key menu features and lets you do to the FB-01 what the other editors let you do to their respective instruments.

ESQ-1 Design, TXR16 Design and DX11,21,400 Support programs

These cater for Ensoniq's ESQ-1 Synthesizer, Yamaha's TXR16 expander module and Yamaha's 4-operator DX21 DX15 and DX400 synthesizers.

RX11/21 Librarian

Here's something slightly different – a Librarian for a drum machine. The program contains over 150 patterns including jazz, latin and rock sets. You can edit and store patterns and mixes and add a 20-line comment to individual patterns.

It is menu driven, Sonus style and displays a grid showing which patterns have been recorded. There are no facilities for composing new patterns or songs, which is a shame – it is purely a Librarian after all – but it is more useful and convenient than storing songs on tape.

Sonus Editors

Two of Sonus's most recent programs are Sonic Editors for the Ensoniq Mirage and Segement's Prophet. These are menu-driven waveform editors which display waveform and program parameters and let you step through the samples page by page to find the best sounding points. You can also draw your own waveforms directly into the system.

You can store sets of 32 sounds (each containing a single page waveform and 38 preset parameters) on a disk and a library of 32 pre-programmed sounds are provided.

Sonus Demo Disk

Finally, if you prefer your information to be presented visually, then the Demo Disk lets the features and gives you screen shots of eight of the main Sonus programs. None are interactive, however, but you can take advantage of Sonus's special 14-day money back guarantee to make sure that the programs you buy does what you want it to do. Contact Sonus for more details.

Summary

The Sonus programs are well-contained pieces of software although some of the Voice Editors, though functional, could have been more inspiring. The Sequencers and Score Track especially are certainly worth a close look if you're after your first piece of MIDI sequencing software.

You can see that Sonus are dedicated to supporting the Commodore's music potential. Write to them for more details of their products or speak to Rosemary, one of the most helpful people in the biz on the other side of a telephone. Sonus have many special offers if you buy two or more of their products.

The Commodore 64 and 128 still have a lot going for them in the music stakes and the availability of the Sonus range of software will hopefully encourage anyone who has not yet taken the plunge into MIDI music to do so.

Footnote:

Supplier: Sonus UK, P.O. Box 14, Wokingham, Reading, RG11 4SP.
Tel: 0734 782996/Contact for prices.

Extended Backgrounds

Extended background mode opens up many possibilities but only allows the use of 64 characters. Until now...

By Paul Williams

The Commodore 64 has many different graphics modes but the least publicised is the extended background mode. This enables characters to have background colours which differ from the selected background but only permits 64 characters to be defined.

The test code program allows any text or user-defined graphics mode to have a unique background colour for each of the 25 screen

lines, but still allows the use of the full 256 characters in the character set. It works by intercepting the television raster scan so that values in the VIC chip can be altered.

To use the routine once it has been loaded with the Basic loader program, Extended Loader, call SYS 49132. The 25 line background colours are then defined by the values of locations \$D2 to \$56 in memory; POKing to these locations will instantly change the background

colour of the corresponding screen line. Foreground colours are set in the same way as before - either using the control-colour keys within PRINT statements or by POKing to the colour map at \$5206 to \$6206.

To demonstrate the use of this mode, you can type in Extended Demo and see what it does.

See listing on page 94

C64 PROGRAMMING

Gyrospeed

C64 tape turbo

By Gary Saunders

Transfer your existing single part programs (Basic or machine code) from tape or disk to turbo tape with Gyrospeed turbo tape facility. Any BASIC program can be loaded easily but machine code files should not load into locations 1004 to 2048 and \$7344 to \$2464. Apart from that, you should have no problems. The load program can then be loaded from tape up to ten times the normal speed. For disk users I've included a directory function, which no doubt, will come in handy, i.e. to find the start address of a specified program.

The title screen has three options to choose from: F1 takes you to the loading menu screen, F2 will now save the program to tape in turbo format. Once saved you can return back to the title screen to save more copies if necessary

requested. Machine code programs also need the run address, this being the SYS address which starts the program, e.g. a machine code program which loads into location 49132 onwards is normally started with SYS 49132 etc...

For disk users it is a good idea to make sure that all SYS calls to machine code files call the start address as in the example above. You then won't have to remember all these SYS calls as the directory function will list all PPO2 type files with their start addresses in memory.

Once the required program has loaded, pressing space will return you to the title screen. F3 will now save the program to tape in turbo format. Once saved you can return back to the title screen to save more copies if necessary

or load other programs or use F3 to quit the program. All turbo programs will autostart when loaded.

Getting it all in

The program is presented in the form of a BASIC loader and should be either typed or loaded in after the following line has been typed:

```
POKE 43,1:POKE 44,32:POKE 8192,8-NEW
```

Once run, the BASIC loader will generate another BASIC type file called 'Gyrospeed' and save it on to disk. If using tape then load the REM statements in the program.

The program can then be loaded like an ordinary BASIC program.

See listing on page 86

CP/M Assembly Language Programming

An in-depth look at the CP/M+ Operating System

By Paul Schofield

If you are a regular reader of *Your Commodore*, you should already know about many of the features offered by the CP/M+ Operating System. If this has prompted you to experiment, you are now no doubt well aware, that after loading CP/M, all you see on the screen is A > . This is not terribly informative, so we are now going to use a simple little program that will make CP/M display a menu of the program files on the disk and let you select one by a single key press.

Assemblers and Compilers

Before you can create any CP/M programs, you need either a Z80 or 8088 Assembler or a high level language compiler. The latter of course, is very much easier and for around \$98, you can buy a top class compiler such as FTL, Modula 2 or Turbo Pascal. As this is likely to be beyond the budget of many readers, we will stick to Assembly Language.

The assembler I have used is GENASM by Hiooft. This is sold as a package called DEVPAC80, which also includes one of the few CP/M full

screen editors and a first class front panel debugger. The assembler supports the proper Zlog Z80 op-codes and pseudo-ops and has very powerful macro capabilities. At just under \$40 this package is very good value for money and I thoroughly recommend it.

If you don't have this package, but have a copy of M88 you can assemble the program using this if you convert the DEP's pseudo-ops to INTEL style DB, DS, I'm afraid if you only have the Digital Research MAC assembler you will have problems. I experimented by changing the pseudo-ops and including Z80.LIB and got about 50 errors. Rather than finding all the alternate INTEL operators I would suggest that you use SID to enter the HEX dump and consider buying a proper Z80 assembler.

Making a Program Auto-start

CP/M's popularity as an operating system has never had very much to do with either its facilities or user

friendliness. In fact in one review of the leading Z80 based operating systems it came last in most categories. Its success lies in its ease of implementation on a wide variety of hardware. However, with CP/M+, Digital Research tackled many of its shortcomings. One new feature was a simple means of auto-starting a program. The mechanism is very simple. During a reboot, the system disk is searched for the file PROFILE.SUB. If the file is found, an attempt is made to execute the command

```
A > SUBMIT PROFILE
```

To make use of this we need to make up a system disk with the file:

```
CP/M+.SYS
CP/M+.COM
SUBMIT.COM
```

We then use an editor to create the file PROFILE.SUB, which is a text file and contains the single line:

```
MENU <cr >
```

In future when this disk is booted, SUBMIT.COM is run, it reads PROFILE.SUB and attempts to locate our program MENU.COM.

Z80 Assembly Language

To those familiar with the 6800, the Z80 instruction set may at first seem a little strange. The main differences are:

(1)most instructions have the form LD destination.

(2)there is no zero page, but many registers; these can be used singly A,B,C,D,E,H,L, or in pairs AF, BC, DE, HL. (The index registers IX, IY have not been used).

(3)many operations do not set the status bits and so it must be done explicitly e.g. OR A.

(4)there are a few complex instructions e.g. LDHR, which is used for block moves and assumes that certain registers are present.

Creating a Program Menu

The intention of our program is to generate a menu of the program files on the disk, so the steps can be summarised as follows:

```
WHILE more files on disk
- find next
- if extension is .COM THEN
- display key and file name
- ENDIF
ENDIFWHILE
get key pressed
execute corresponding program
```

Directory Searching

CP/M makes directory searches very easy for us by providing BDOS function calls to do precisely what we want. To use these we must know, how to call a BDOS function, how to supply file information and where to find the information returned by CP/M.

Fortunately the first two of these are quite simple. To make any BDOS call, we first set the function code in register C and the function parameter (if any) is placed in the register pair DE. Finally we call the BDOS entry point, 0034H. A good example is provided by the subroutine CHROUT

at the start of the listing, which is used to output a character to the screen.

For file related functions, it is clearly not possible to pass all the required information in a register pair, so instead we pass the address of a parameter block called the PCB (File Control Block). This is a standard CP/M structure of which we will see only a small portion for the filename and filetype.

```
PCB: 1 byte - not used
      8 bytes - filetype
      1 byte - filetype
      21 bytes - not used
```

As we wish to find any .COM file, we initialise filename to the string "TTTTTT" and filetype to "COM". We are now ready to use the BDOS functions 17 and 18 to find respectively the first and subsequent files matching this specification.

The response from CP/M is a single byte value in the A register, which the manual tells us is either 0FFH (no file) or an offset multiplier. The offset multiplier tells us whereabouts in the DMA (Direct Memory Access) area we will find the file data. The formula used is: 0040H (DMA default addr) + 12 * A.

- Menu Display & Program Execution

Having found the program files, it is very simple to display the menu using the standard BDOS calls for character and string output and finally wait for a user input using CONIN. The one problem remaining is to separate the selected program. This is done once again by a BDOS call, which initially requires the filename of selected file to be placed at the start of the DMA area.

As you can see from the completed program, most of the I/O operations have been made very simple by CP/M and the majority of the code is involved simply with calculating offsets to data and moving data from one area to another.

To date, most discussion of the C128's CP/M Mode has concentrated on the range of business packages that are available. Little has been said, however, about writing your own programs in this mode. While the limited screen display facilities mean you are certainly not going to write the

next mega-bit arcade game in this mode, there remain several good reasons for widening your programming horizons. Consider the following:

- faster and simpler disk file operations,
- very wide choice of professional program development packages,
- finished programs can be used on a wide variety of computer systems,
- large base of Public Domain software, providing many useful routines.

In this review we are going to look at just some of the assemblies and compilers available for the C128 in CP/M mode. At present there are few UK retailers stocking these, but the two companies mentioned at the end of the article specialise in supply of CP/M and MS-DOS software at competitive prices. When ordering for the C128 you should state either the disk drive (not 1341) or the MFM format e.g. RAYPRO II.

Assemblers

Even if you intend to program mainly in a high level language, an assembler is always useful for those odd little routines. There are three main contenders in this market and the choice will depend on the intended usage.

If you get the Commodore CP/M utilities pack, this contains the Capital Research MAC and RMAC assemblers. These are Intel 8080 Assemblers and can be used to write Z80 programs using the Z80 macro library on the CP/M sources disk. This is alright for short subroutines, but not really suitable for writing large assembly language programs.

The most widely used CP/M Assembler is M88 by Microsoft. This has the advantage that you can choose whether to use 2800 or 1880 mnemonics, which can be useful when you want to make use of library routines. This is a very comprehensive package including a linker, librarian and cross-reference utility. On the negative side it uses mainly Intel Pseudocode and at around 180 is still rather expensive.

At about half this price, Hisoft's DEWPAK90 is a true Z80 Macro-Assembler package. This is the proven

up version of their very popular Spectrum assembler package and has the big bonus of a first-class full-screen editor. This supports Wordstar commands as default, but you can redefine them how you like. The second program is GEN88 the assembler, which has a powerful MACRO facility and produces COM files directly. If you have run-time problems then you load up MON88 a powerful front panel debugger which allows you to see just what's happening. A first class package at a very reasonable price.

BASIC

CP/M gives you a good opportunity to come to grips with more sophisticated programming languages, but those who wish to remain faithful to the old war horse are well catered for.

If you prefer an interpreter to a Compiler, Midland BASIC may be worth a look. This is essentially the same BASIC as used in the Amstrad, but adapted for CP/M. For some reason Amstrad versions have more features than others, but cost about half the price and this should mean or less money that it is little used on other machines.

A more obvious choice therefore might be M-BASIC from Microsoft, who wrote the Commodore's BASICs. Fortunately this version is much more comprehensive than BASIC 2.0, but you should have few problems adapting. This can still be rather an expensive package and looks overpriced for a price cut. Watch out for package deals with MSX, if you are interested in both. The main advantage is the large quantity of existing software in this dialect.

C-BASIC, Digital Research's Commercial BASIC also has large libraries of existing software. It has some useful facilities, but is generally rather lacking in features. Take care as both interpreters and full compilers are sold. A budget priced version of the compiler for the Amstrad is now available, but it is generally expensive.

A fairly recent newcomer is Z-BASIC. This is supposedly quite similar to M-BASIC, but has some nice extensions such as labelled GOTO and GOSUB, automatic indenting and variable precision for floating point arithmetic. It also provides some nice user facilities like those of Turbo Pascal, and with very fast benchmarks

and a price tag of around £70, looks the pick of the bunch.

Pascal

If you are thinking of moving on from BASIC, Pascal is the logical choice and CP/M gives you the choice of some really top class products.

If you are an ICPLUG member (and you really should be if you are reading Britain's only serious Commodore Magazine!) then you can get JET Pascal for the price of an empty disk and postage. Ask for disks CL2 & CL3. I know nothing about this compiler, but you can't grumble at the price.

The compiler by which most others are now judged is Borland's Turbo Pascal. This sets new standards of performance, usability and price when it was released and the opposition has only recently started to catch up. It is often criticised for its very non-standard Pascal extensions (what is a standard extension?!), but about half a million satisfied users will tell you, that this gives you a real 'do anything' high level language system. Unlike many Pascals, it also has adequate provision for most scientific work. If you have around £50, you can't go far wrong with Turbo.

A good low cost alternative is Pascal80 from Hisoft. This comfortably wins the Pascal speed stakes, but lacks accuracy in floating point operations. The latest version is packaged with ED80 and achieves much of the user friendliness of Turbo Pascal. At £40 this is a good package for the beginner.

Two other compilers should also be mentioned in this section. DR's MT Pascal is a very good compiler, with extensive CP/M libraries in existence, but low cost versions have only just appeared for the Amstrad. Paragon of course will insist on the full ISO standard Prospero Pascal, it is just a pity that they will probably have to sell their £28 to buy it.

C

C is the high level language favoured by assembly language programmers, who are forced to use a high level language as it allows you to continue writing understandable programs. To be fair C is excellent for systems software. Most CP/M compilers for C fall into

the category of 'very expensive'. HDSC, for example will set you back over £100 and only supports integer arithmetic. For floating point capability the choice lies between AXTEC C (approx £180) or DCO C, which is depressingly slow but a relative bargain at about £80. For systems work of course floating point is not essential and Hisoft's offering at around £40 should satisfy most needs, although the performance is not that exciting to say the least.

Modular 2

This is another language from Nicholas Wirth, the author of Pascal and is quite similar to ADA, but is much easier to compile. If you can live with a language in which FRED, fred and Fred are all different variables, it's very good and has the big advantage that it is very easy to reuse bits of your old programs. Used recently the cost of a compiler used to be a deterrent, but you can get a basic PTL Modular-2 compiler for £50.

With unusually good floating point provision and sensational benchmarks, this product seems destined to finally dislodge Turbo Pascal from the top compiler spot. One word of warning, however, while Modular-2 is a very good language to learn it cannot be recommended to those with no previous Pascal experience, as good textbooks are very expensive.

Fortran & COBOL

These very old languages cannot be recommended unless you use them already. Fortran is still useful for scientific applications and at about £40 Nevada Fortran is good value. There is a similarly named and priced COBOL compiler, but for data intensive applications DBASE II is probably a better bet.

Footnote:

Supplies: CP/M Software, Gray Matrix, & Price Monitor, Ashburton, Devon TQ11 7DF. Tel: 0364 23498. The Software Touchbox, The Old School, Greenfold, Bradford MK4 5SE. Tel: 0323 768274.

Table 1: Commodore 128

Line	Address	Value	Comment
0000	0	0	0
0001	1	0	0
0002	2	0	0
0003	3	0	0
0004	4	0	0
0005	5	0	0
0006	6	0	0
0007	7	0	0
0008	8	0	0
0009	9	0	0
000A	10	0	0
000B	11	0	0
000C	12	0	0
000D	13	0	0
000E	14	0	0
000F	15	0	0
0010	16	0	0
0011	17	0	0
0012	18	0	0
0013	19	0	0
0014	20	0	0
0015	21	0	0
0016	22	0	0
0017	23	0	0
0018	24	0	0
0019	25	0	0
001A	26	0	0
001B	27	0	0
001C	28	0	0
001D	29	0	0
001E	30	0	0
001F	31	0	0
0020	32	0	0
0021	33	0	0
0022	34	0	0
0023	35	0	0
0024	36	0	0
0025	37	0	0
0026	38	0	0
0027	39	0	0
0028	40	0	0
0029	41	0	0
002A	42	0	0
002B	43	0	0
002C	44	0	0
002D	45	0	0
002E	46	0	0
002F	47	0	0
0030	48	0	0
0031	49	0	0
0032	50	0	0
0033	51	0	0
0034	52	0	0
0035	53	0	0
0036	54	0	0
0037	55	0	0
0038	56	0	0
0039	57	0	0
003A	58	0	0
003B	59	0	0
003C	60	0	0
003D	61	0	0
003E	62	0	0
003F	63	0	0
0040	64	0	0
0041	65	0	0
0042	66	0	0
0043	67	0	0
0044	68	0	0
0045	69	0	0
0046	70	0	0
0047	71	0	0
0048	72	0	0
0049	73	0	0
004A	74	0	0
004B	75	0	0
004C	76	0	0
004D	77	0	0
004E	78	0	0
004F	79	0	0
0050	80	0	0
0051	81	0	0
0052	82	0	0
0053	83	0	0
0054	84	0	0
0055	85	0	0
0056	86	0	0
0057	87	0	0
0058	88	0	0
0059	89	0	0
005A	90	0	0
005B	91	0	0
005C	92	0	0
005D	93	0	0
005E	94	0	0
005F	95	0	0
0060	96	0	0
0061	97	0	0
0062	98	0	0
0063	99	0	0
0064	100	0	0
0065	101	0	0
0066	102	0	0
0067	103	0	0
0068	104	0	0
0069	105	0	0
006A	106	0	0
006B	107	0	0
006C	108	0	0
006D	109	0	0
006E	110	0	0
006F	111	0	0
0070	112	0	0
0071	113	0	0
0072	114	0	0
0073	115	0	0
0074	116	0	0
0075	117	0	0
0076	118	0	0
0077	119	0	0
0078	120	0	0
0079	121	0	0
007A	122	0	0
007B	123	0	0
007C	124	0	0
007D	125	0	0
007E	126	0	0
007F	127	0	0
0080	128	0	0
0081	129	0	0
0082	130	0	0
0083	131	0	0
0084	132	0	0
0085	133	0	0
0086	134	0	0
0087	135	0	0
0088	136	0	0
0089	137	0	0
008A	138	0	0
008B	139	0	0
008C	140	0	0
008D	141	0	0
008E	142	0	0
008F	143	0	0
0090	144	0	0
0091	145	0	0
0092	146	0	0
0093	147	0	0
0094	148	0	0
0095	149	0	0
0096	150	0	0
0097	151	0	0
0098	152	0	0
0099	153	0	0
009A	154	0	0
009B	155	0	0
009C	156	0	0
009D	157	0	0
009E	158	0	0
009F	159	0	0
00A0	160	0	0
00A1	161	0	0
00A2	162	0	0
00A3	163	0	0
00A4	164	0	0
00A5	165	0	0
00A6	166	0	0
00A7	167	0	0
00A8	168	0	0
00A9	169	0	0
00AA	170	0	0
00AB	171	0	0
00AC	172	0	0
00AD	173	0	0
00AE	174	0	0
00AF	175	0	0
00B0	176	0	0
00B1	177	0	0
00B2	178	0	0
00B3	179	0	0
00B4	180	0	0
00B5	181	0	0
00B6	182	0	0
00B7	183	0	0
00B8	184	0	0
00B9	185	0	0
00BA	186	0	0
00BB	187	0	0
00BC	188	0	0
00BD	189	0	0
00BE	190	0	0
00BF	191	0	0
00C0	192	0	0
00C1	193	0	0
00C2	194	0	0
00C3	195	0	0
00C4	196	0	0
00C5	197	0	0
00C6	198	0	0
00C7	199	0	0
00C8	200	0	0
00C9	201	0	0
00CA	202	0	0
00CB	203	0	0
00CC	204	0	0
00CD	205	0	0
00CE	206	0	0
00CF	207	0	0
00D0	208	0	0
00D1	209	0	0
00D2	210	0	0
00D3	211	0	0
00D4	212	0	0
00D5	213	0	0
00D6	214	0	0
00D7	215	0	0
00D8	216	0	0
00D9	217	0	0
00DA	218	0	0
00DB	219	0	0
00DC	220	0	0
00DD	221	0	0
00DE	222	0	0
00DF	223	0	0
00E0	224	0	0
00E1	225	0	0
00E2	226	0	0
00E3	227	0	0
00E4	228	0	0
00E5	229	0	0
00E6	230	0	0
00E7	231	0	0
00E8	232	0	0
00E9	233	0	0
00EA	234	0	0
00EB	235	0	0
00EC	236	0	0
00ED	237	0	0
00EE	238	0	0
00EF	239	0	0
00F0	240	0	0
00F1	241	0	0
00F2	242	0	0
00F3	243	0	0
00F4	244	0	0
00F5	245	0	0
00F6	246	0	0
00F7	247	0	0
00F8	248	0	0
00F9	249	0	0
00FA	250	0	0
00FB	251	0	0
00FC	252	0	0
00FD	253	0	0
00FE	254	0	0
00FF	255	0	0

control the waveforms of the various voices, so let's take a look at just one of these registers, namely V+4.

```

020 064 032 016 000 004 002 001
007 006 005 004 003 002 001 000
000 001 001 001 000 002 003 001
    
```

This is a multi-purpose register, and we can fiddle with every bit of bit except bit three, which seems to have no purpose in life, poor thing.

Bits seven, six, five, four and zero are used purely for the waveforms. That is, POKEing V+4 with either 120+1, 64+1, 32+1 or 17+1 selects one of the four waveforms. POKEing V+4 with either 128, 64, 32 or 16 turns the waveform off again, although a zero would do the job just as well.

Bit two is the one that interests us here, since this is the one that affects the ring modulation. Setting this bit to one turns ring modulation on, while setting it to zero turns ring modulation off again. Thus the effect can be either on or off, no half measures here I'm afraid.

So, if we had selected the sawtooth waveform for voice three and a triangle one for voice one, and we wanted to modulate voice one with respect to voice three we could either POKE V+4,21 on, to be on the safe side, POKE V+4,PEEK(V+4) or 4 for this later option whatever was set would remain set, and bit two would now be turned on as well. By playing a note we could now see the effects of ring modulation on voices one and three.

It works in the same way for any of the other voices, so that attempting to modulate voice two with respect to

voice three would require us to POKE V+1,PEEK(V+1)+GR-4, and so on. Setting everything to a triangle waveform and modulating all voices with respect to each other is the ultimate in ring modulation, and in the following example we'll see just what sort of thing can be achieved. Let's go back to our Clear Encounters theme. (See last of pages).

Almost the same as before, but this time we're using the ring modulation effect and setting all the voices to be triangular waveforms. This is achieved by POKEing a 11 into all the waveform registers in line 25. As before, line 35 halts proceedings until the space bar is pressed, whereupon the program loops off back to line 25 to get another note. With just this minor change, you can see how dramatically different the effect can be.

You might now care to amend some of the earlier programs to incorporate this effect, so that for example we could be playing notes in different octaves and having everything modulated with respect to everything else, or we could be playing chords, so that the three different notes in the chord are again all being modulated with each other. The difference in sound is really quite surprising.

At the moment, we can only really use this ring modulation as a novelty item, and we can't in all honesty, produce anything startlingly useful.

Synchronisation is another great weapon at our disposal, and by combining the two effects we can begin to make great progress.

Synchronisation

The basis behind all true synthesizers, and also the basis for the works

produced by 'electronic' composers such as Jean Michel Jarry, or groups like Tangentia Dream, is synchronisation. That is, you set up one voice to play a straightforward musical tune, like the 'riff' to be found in Tubular Bells, for example (which we'll be looking at in a moment), and then synchronise the voice playing that riff with another voice. Thus, while the one voice merrily carries on playing its little tune to itself over and over again the composer or group can simply play with the other voice, in the confident knowledge that the 'riff' voice will attempt to follow it, or synchronise with it.

To put it another way, voice three might be playing its tune in the key of C, while voice one is being made to play notes, C, F, C, G, F and back to C again. This is the simple 12 bar boogie stuff that has made vast fortunes for a number of different groups over the years. The reason C then tries to follow this sequence of C, F, C, G, F and back to C again, the results being anything from wonderfully musical to truly cacophonous. The skill of the musician is to increase the level of wonderful and decrease the level of cacophony. Our task is to make the thing happen in the first place, and worry about the noise afterwards.

Combining synchronisation with ring modulation can produce some quite surprising results, but we'll leave that one for now and concentrate solely on synchronisation. As with ring modulation, we'll take a look at the rules of the game first.

Some Rules

There aren't any - thank goodness! What this feature tries to do is match the fundamental frequency of the note being played by one voice with the fundamental frequency of a note being played by another. Thus, if we want to synchronise voices one and three, voice three could be playing our Tubular Bells riff mentioned earlier, and then by altering the frequency of the notes being produced by voice one we could make voice three try and follow it around.

Note that it is only the fundamental frequencies that are affected here, the rest try and carry on as if absolutely nothing has happened. This has the effect of producing what one would like three voices from just two, in one set of frequencies carry

```

3 FOR I=0 TO 2:POKE 54722+I,NEXT
10 V=54722
15 POKE V+26,15
20 POKE V+5,0:POKE V+4,240
21 POKE V+12,9:POKE V+13,240
22 POKE V+18,32:POKE V+20,6
23 FOR I=0 TO 2:POKE V+17+4,0:POKE V+17+4,21:NEXT I
30 READ F:IF F=-1 THEN FOR I=0 TO 2:POKE V+10+2*I,0
31 F=INT(F/120):PI=F-PI*256
32 FOR I=0 TO 2
33 POKE V+17+I,POKE V+17+I,PI
34 NEXT I
35 GET AS:IF AS <> " " THEN G15
40 GOTO 25
80 DATA 1204,1351,1432,536,960
91 DATA -1
    
```

as as before, the fundamental one tries to follow the other voice, while that other voice is also playing a tone, or series of notes, all of its own.

Since it is these fundamental frequencies that are being matched, the only rule that we must obey is the frequencies of the notes being played by voice three (assuming synchronization is between voices one and three) must be lower, or equal to, those being played by voice one, otherwise not very much happens. You can try using higher frequencies if you like, and indeed you are encouraged to do so since, as we've seen, the only way of getting the best out of the SID chip is to mess about with the control registers and see what happens. However, theory must as usual come before practice, so let's take a look at the registers being affected by synchronization.

Bits of Information

We start with ring modulation that the registers in question write those used to determine the waveform of the three voices, and that those registers were multi-purpose ones. Huzzah a wild guess as to what the third function of those registers is? Yes, hard to believe isn't it, as well as controlling waveform and ring modulation they also look after synchronization.

This actually makes quite a bit of sense from the point of view of the designers of the chip, since synchronization, like ring modulation, can either be on or off, and only one bit is required to do that. There are only two waveforms that can be selected, so four bits are needed, and those waveforms can be either on or off, requiring one further bit. Consequently, there is even a spare bit left over to do nothing, redundancy, and a criminal waste. Let's look at the chip to see precisely what it is that we're going to be altering.

```
130 004 032 0 16 008 004 002 001
007 005 005 004 003 002 001 000
001 001 001 001 000 002 003 000
```

The bit to keep an eye out for this time is bit one, labelled three in the bottom line of information, since it is the third part of this register that we're going to be looking at. Rather like ring modulation, synchronization can be either on or off, and each of the three registers works in exactly the same way.

To turn it on, we need to alter bit one by (assuming our base of V=34272 and altering just the only voice) POKE V+4*PEEK(V+4) OR 2. Therefore only this first bit is altered, leaving everything else as it was before we came along. Since, for the purpose of our example program we want to synchronize voice one with respect to voice three, this will be fine. Voice three can carry on in its own sweet way, with no great interference from us. Let us first of all set up the start of the program in our usual way.

```
5 FOR I=0 TO 24:POKE 34272+I,
0:NEXT I
10 V=34272
15 POKE V+24,15
20 POKE V+5+POKE V+6,20
21 POKE V+12+POKE V+13,20
22 POKE V+19,30:POKE V+20,36
23 FOR I=0 TO 2:POKE V+97+4*I,
POKE V+17+4*I (I*(16+3):NEXT I)
```

This sets up our three voices to have different waveforms, and to be synchronized with each other. This, of course, is impossible, as Escher musical involves everything playing at a lower note than everything else which just cannot be achieved, but at least it will make a notable noise and you'll be able to listen to the results!

Now we need the data for the Tubular Bells riff, and as any fans of Mike Gilfield will know the notes we need are D, E, C, D, F, G, E, F, E before going back to the start again. Fortunately for us the delays between the notes being played are quite straightforward, consisting of a standard delay of whatever length we choose and a half of that delay.

So, our data statements become:

```
100 DATA 2465,10,2195,10,2465,10,
2465,10
101 DATA 3265,10,2765,10,2930,10,
2565,10,0,0
```

The next line of our program can now be used to read this in and set up the high value and low value frequencies.

```
10 READ F:IF F=0 THEN
RESTORE:GOTO 30
32 FH=INT(F/256):FL=F-FH*256
34 READ DL
15 FOR I=0 TO 2:
35 POKE V+17+4*I,FL:POKE V+19+4*I,
FH*0.5FL
36 FOR I=1 TO 26:*100:NEXT I
40 GOTO 25
```

I think you'll agree, that this produces quite an unusual effect.

You might now care to try your hand at introducing chords, or notes being played at different octaves, and see what the results of that might be. We cannot yet get onto true synchronization, because we would need an inner knowledge of how musical intervals work and how we can combine them with a synthesizer program.

And before we can do that, we also need to know something about the workings of the last major feature of the SID chip, namely the filtering techniques. If you think ring modulation and synchronization were using multi-purpose registers, well, in the words of someone relatively famous, 'You Ain't Seen Nothing Yet'!

Filtering

A much misunderstood and, as a consequence, much undervalued aspect of the Commodore 64's music capabilities is the idea of filtering. People who have managed to master this aspect of things have produced some wonderful sound programs over the years, whether as simple effects for games or background soundtracks of seemingly limitless duration and soaring originality, and you can guarantee that every successful music package sold for the Commodore 64 has had, at its heart, a deep working knowledge of filtering and how it works.

On the Commodore 64 we have four different types of filtering available to us. All work on the same principle, but adapt that principle for different needs, depending on the type of filtering selected. One can independently filter any or all of the three voices, but once filtering has been selected that any voices which are being filtered are all subject to the same type of filtering, and the same effects of selecting that type are also common to all the voices. This is similar to the volume control, although as with that particular option, things can be programmed in such a way as to seemingly get around that limitation.

As with a number of other control registers on the SID chip, filtering is achieved by using two-multi-purpose registers, and one of these is the aforementioned volume control - register V+24. If we assume, as usual, our base location is 34272 and the variable V is

be set equal to that value. Therefore we must do away with our long held belief of simply POKing V+24.15 to turn the volume on to maximum, and POKing V+24.0 to turn it off altogether. As we shall see, POKing that particular register affects far more than just the volume.

But first, let's look at the four different types of filtering.

High Pass Filter

As with all the other types, this particular effect depends on a selected frequency, which is known as the cutoff frequency. We shall see how that is selected in a moment. Having determined the cutoff frequency, then, selecting a high pass filter ensures that the level of frequencies below the cutoff point are drastically reduced, while all those equal to it or higher than it are passed through as normal.

Therefore a note of frequency 1000 cycles per second, or hertz, coupled with a high pass filter and a cutoff frequency of 1100 hertz, would sound rather quiet! All frequencies below 1100 hertz would be reduced, and thus the note itself would be reduced into relative silence. Selecting a cutoff of about 900 hertz would, on the other hand, produce something. No note consists of just a single frequency, since all the waveforms (triangle, sawtooth, pulse and noise) produce a variety of harmonics around the desired frequency. Selecting a filter and a cutoff frequency can therefore be used to amplify or reduce frequencies around a certain point, and helps to simulate more accurately a variety of musical instruments.

A high pass filter lets everything through higher than or equal to the cutoff frequency, while reducing everything lower than it.

Low Pass Filter

This, as you might expect, is the exact opposite of the high pass filter, although it operates on the same principle and still requires a cutoff frequency to be set. This time, everything lower than the cutoff frequency is passed through as normal, while everything higher than it is severely reduced. For example, a note of frequency 1000 hertz when played through a low pass filter using a cutoff frequency of around 1100 hertz would sound perfectly normal (well, almost) while changing the cutoff

frequency to about 900 hertz would severely limit the sound.

A low pass filter, lets through everything lower than or equal to the cutoff frequency, while reducing everything higher than it.

Band Pass Filter

This would be something that would be useful on a television, allowing only certain groups to be played and getting rid of anything extraneous. On the Commodore 64, however, a band pass filter allows only a narrow band of frequencies to be played around the cutoff frequency, while rejecting everything below or above that band. Therefore a note of 1000 hertz played through a band pass filter with a cutoff frequency of 1000 hertz would sound less 'full' than normal since all the usual harmonics have been severely reduced, leaving just a narrow band of frequencies to get through.

In other words, a band pass filter lets through everything in a band of frequencies around the cutoff frequency, and reduces everything either higher or lower than the band.

Notch Reject Filter

The complete opposite of a band pass filter, and strictly speaking one that doesn't exist on the Commodore 64. However, by combining the already mentioned high pass and low pass filters we can produce this fourth extra filter. This time, if we select a notch reject filter and our usual cutoff frequency, everything within a narrow band centered around the cutoff frequency is rejected, while everything outside it passed through as normal. This has the effect of cutting down on the main 'sound' of a note while only playing the 'extremes' of the frequencies.

To conclude, a notch reject filter reduces everything in a narrow band, or notch, around the cutoff frequency, while letting through everything outside that notch. How does one select these various filters?

Voice and Filter Selection

Let us first of all consider the different types of filter, and the best way to do this is by looking at the register V+24.

```
128 064 032 016 008 004 002 001
007 006 005 004 003 002 001 000
3 4 3 2 1 1 1 1
```

Bits seven to three of this register are used to control the volume, and can be seen to have the values 0 to 15. Bit four is used to select a low pass filter, so POKe V+24/PORe(V+24) OR 16 turns on a low pass filter while keeping the volume at its normal level. Or, if you like, POKe V+24.1 sets a low pass filter with a maximum volume.

Bit five is used to select a band pass filter, so that POKe V+24.47 can be used to select that filter while keeping the volume at maximum level.

Bit six is used to select a high pass filter, so that POKe V+24.78 can be chosen to switch a high pass filter on, switch all the others off, and again keep the volume at maximum level.

Bit seven is used to turn all the filters off, so POKe V+24.143 does precisely that, but once more keeps the volume at maximum.

Finally our 'hybrid' filter is chosen by combining a high pass with a low pass filter for the notch reject filter, so to set that we must POKe V+24.(64+16+15) or POKe V+24.95.

Having turned them on, which voice are we going to use and how are we to select the cut off frequency? There are three more registers to consider now, namely V+21, V+22 and V+23. We'll look at the latter first.

```
128 064 032 016 008 004 002 001
007 006 005 004 003 002 001 000
4 4 4 4 0 3 2 1
```

We'll ignore bit three, since that is used only for an external input, and we're not about to turn four Commodore 64s into a mass of circuit diagrams.

Quite simply, turning on bit zero will select voice one to be filtered, turning on bit one will select voice two to be filtered, and turning on bit two will select voice three to be filtered. Turning on all the bits will select all three voices to be filtered, and any combination can be chosen as you see fit.

Bits four to seven determine the filter resonance, that is, the amount of resonance that one can expect with respect to the cut off frequency. Giving four bit number 0 can contain any value between 0 and 31, and rather like our discussion on A/DRA it is easiest to think of it this way, multiplying the value on the range 0 to 31 to find out which value should really be POKed in there.

Finally we have to select the cut off frequency, and this is determined by using control registers V+21 and V+22.

```
128 064 032 016 008 004 002 001
007 006 005 004 003 002 001 000
  1  1  1  1  1  1  1  1
```

```
128 064 032 016 008 004 002 001
007 006 005 004 003 002 001 000
  0  0  0  0  0  1  1  1
```

Top register=V+22, or 54294.
Bottom register=V+21, or 54293.

All eight bits of the top register are

used, meaning that values from 0 and 255 can be stored there. Only the first three bits of the bottom register are used, which means that values in the range 0 to 7 can be put in there. This latter works in an analogous way to our high value and low value frequencies already encountered, so that to get the true frequency we must multiply the value in register (V+21) by 256 and then add the value found in register (V+22). Remember that these are write-only registers, and any values that are to be POKEd in them or PEERed out of them must be kept in a separate variable.

As an example, if I wanted to use

a cut off frequency of 3000 hertz (the two locations combined give us a range of 0 to 2047), then we must find the integer result of dividing 3000 by 256, which equals 11, then find the result of subtracting 256 times 11 from 3000, or 232. Thus we would POKE V+22:POKE V+21:232.

This is one of the many things on the SID chip that is best explained by diagrams, programs and just listening to the effects - watch this space and we'll explain further in our next installment of Making Music.



LIFESAVERS 9	C64	OLD	1/3
<p>One of the most useful commands that is missing from the C64 Basic is OLD. This allows any Basic program to be recovered after a NEM or system reset (SYS 64739).</p> <p>This OLD instruction works by simply restoring the original start and end of program values into memory locations 43,44,45 and 46 as well as restoring values in at the original start of the Basic program, e.g line number start, start of program, end of program etc.</p> <p>You could save OLD as a machine code file and recall it as needed, without using the Basic loader.</p> <p>SYS 400 to start the OLD program.</p>		<pre>10 REM ***** 20 REM OLD ROUTINE 30 REM ***** 40 BL=1:LN=50:SA=400 50 FOR L=0 TO BL:CX=0:FOR D=0 TO C 15:READ A:CX=CX+A:POKE SA+L*1 6+D,A:NEXT D 60 READ A:IF A>CX THENPRINT"ER 60R IN LINE":LN=(L*10):STOP 70 NEXT L:END 80 DATA 160,1,160,255,145,43,33 151,165,24,169,2,101,34,133,45, 1529 90 DATA 169,0,101,35,133,44,72, 94,166,0,0,0,0,0,0,816 100 PRINT "SYS 400 TO ACTIVATE OLD ROUTINE"</pre>	

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Programs on the disk will also be supplied as totally working versions, i.e. when possible we will not use Basic Loaders thus making use of the programs much easier. Unfortunately at the moment we cannot duplicate C16 and Plus/4 cassettes. However programs for these machines will be available on the disk.

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At the top of each article you will find a strip containing the article type, C64 Program etc. So that you can see which programs are available on which format, you will also find a couple of symbols after this strip. The symbols have the following meaning:



This symbol means that the program is available on cassette.



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Listings

*Get it right first time with our deluxe program system
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You may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the funny numbers by the side of each line of the listing. First of course, it's all part of our easy entry aid.

Instead of those nasty graphics and rows of countless spaces in PRINT statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll soon learn to decipher their meanings.

For example, [SA] would mean type in a Shifted A, or an ace of spades in layman's terms, and [SA:10] would mean a row of ten of these symbols.

[S+2] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realise that [C+2] means exactly the same thing except that the Commodore key (bottom left of the keyboard) is held down instead of the shift key.

If more than two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [8SPC4]. Translated into English this means press the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as:

[CTRL N, DOWN2,LEFT5,BLUE,
F3,C3]

This would be achieved by holding

down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked BLUE while holding down the CTRL key, press the F3 key and, finally hold the Commodore key down while pressing the number two key (C2) would of course make the computer print in brown.

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears:

[88]C"

In this case the two characters should have a comma between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark ([SHIFT + 2]) and delete it. This gets the computer out of quotes mode. Hold down CTRL and press the number nine key ([V9ON]), type the relevant number of reversed T's and then hold down CTRL and press zero ([V9OFF]). Next type another quotation mark and delete it again. Now finish the line and press RETURN.

A list of those special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT string; the symbol for pi. This may appear where its value is needed in a calculation so this may look something like:

CC="3][PI]*R;

Ignore the square brackets and just type in a shifted upward pointing arrow (ie. the pi symbol).

PROGRAM	START	END	ROW
0	000	000	0000
00	0000	0000	0000
01	0000	0000	0000
02	0000	0000	0000
03	0000	0000	0000
04	0000	0000	0000
05	0000	0000	0000
06	0000	0000	0000
07	0000	0000	0000
08	0000	0000	0000
09	0000	0000	0000
10	0000	0000	0000
11	0000	0000	0000
12	0000	0000	0000
13	0000	0000	0000
14	0000	0000	0000
15	0000	0000	0000
16	0000	0000	0000
17	0000	0000	0000
18	0000	0000	0000
19	0000	0000	0000
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22	0000	0000	0000
23	0000	0000	0000
24	0000	0000	0000
25	0000	0000	0000
26	0000	0000	0000
27	0000	0000	0000
28	0000	0000	0000
29	0000	0000	0000
30	0000	0000	0000
31	0000	0000	0000
32	0000	0000	0000
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85	0000	0000	0000
86	0000	0000	0000
87	0000	0000	0000
88	0000	0000	0000
89	0000	0000	0000
90	0000	0000	0000
91	0000	0000	0000
92	0000	0000	0000
93	0000	0000	0000
94	0000	0000	0000
95	0000	0000	0000
96	0000	0000	0000
97	0000	0000	0000
98	0000	0000	0000
99	0000	0000	0000

by Eric Doyle

Checksum Program

The hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can see our line checking program.

Type in the Checksum Program, make sure that you've not made any mistakes and save it to tape or disk

immediately because it will be used with most of the present and future listings appearing in *Your Commodore*.

At the start of each programming session, load Checksum and run it. The screen will turn brown with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and

press RETURN again.

If you want to turn off the checker simply type `SYN40152` and the screen will return to the familiar blue colours. You can then do whatever it was you wanted to do and if this doesn't use the area where Checksum lies you can go back to it with the same `SYN` command.

No system is foolproof but the chance of two errors cancelling one Mary of the listings are presented in lower case. To turn your computer to lower case mode press the Commodore key and the SHIFT key at the same time. ☺

Mnemonic	Symbol	Keypress
[RIGHT]		CRSR left/right
[LEFT]		SHIFT & CRSR left/right
[DOWN]		CRSR up/down
[UP]		SHIFT & CRSR up/down
[F1]		F1 key
[F2]		SHIFT & F1 key
[F3]		F3 key
[F4]		SHIFT & F3 key
[F5]		F5 key
[F6]		SHIFT & F5 key
[F7]		F7 key
[F8]		SHIFT & F7 key
[HOME]		CLR/HOME
[CLR]		SHIFT & CLR/HOME
[BVSON]		CTRL & 9
[BVSOFF]		CTRL & 0

Mnemonic	Symbol	Keypress
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8
[POUND]		£
[LBARROW]		←
[RBARROW]		→
[F1]		SHIFT & →
[INST]		SHIFT & INST/DEL
[KEY T]		see text
[Clear]		CBM + letter
[Store]		SHIFT + letter

LISTINGS

5 76.50 2000
 2472 DATA138.78.80.129.75.33
 148.78.87.131.76.132.133.134
 135.136.137.138
 2480 DATA140.74.134.135.136.
 136.138.139.56.139.200.167.32
 8.169.52.173.2000
 2482 DATA143.138.141.56.128.
 75.82.128.200.84.138.173.84
 138.169.200.2000
 2500 DATA153.195.143.138.200
 78.173.167.139.148.136.151.
 151.56.138.78.3210
 2502 DATA158.129.136.56.128.
 173.56.138.200.148.128.200.8
 173.200.128.2000
 2503 DATA158.128.138.84.200.5
 8.128.173.84.138.148.200.152
 1.200.152.138.2000
 2504 DATA158.128.138.169.138
 148.138.133.141.58.138.99.7
 2.32.147.138.2000
 2540 DATA174.248.130.224.1.2
 86.2.254.86.173.58.138.251.2
 4.265.73.2000
 2550 DATA173.58.128.201.79.2
 88.86.130.32.99.138.148.8.18
 4.141.80.1710
 2552 DATA177.57.141.81.8.3
 3.78.130.82.248.128.173.63.3
 32.1200
 2573 DATA210.235.160.8.177.5
 7.141.80.3.173.81.3.143.37.1
 59.59.1730
 2580 DATA211.24.128.169.24.1
 41.58.128.32.32.138.148.8.17
 3.65.5.1480
 2582 DATA230.57.141.55.138.8
 8.78.88.138.32.248.128.134.1
 30.32.115.1780
 2600 DATA238.148.0.177.87.14
 2.55.128.88.76.56.129.173.30
 3.128.141.1880
 2610 DATA238.128.78.82.129.17
 2.58.128.174.88.128.34.78.34
 8.220.26.1830
 2612 DATA238.248.258.140.36.1
 38.143.58.128.98.0.0.8.889.1
 99.73.1710
 2618 DATA238.139.104.94.128.18
 8.147.32.310.253.88.78.0.128
 173.88.1880
 2640 DATA238.148.0.163.4.153
 77.134.88.142.8.240.84.545.
 57.24.2520
 2650 DATA238.40.133.87.148.8
 8.105.0.123.28.128.200.248.3
 88.37.24.2000
 2660 DATA238.56.128.133.87.1
 85.58.195.8.133.88.96.173.88
 128.200.1840
 2670 DATA238.128.208.11.173.
 58.128.200.163.128.200.3.92.
 138.130.171.2020
 2680 DATA238.128.141.58.128.78
 138.148.0.1880
 2690 DATA241.200.128.141.200
 138.148.48.141.147.128.169.
 28.141.990.128.2000
 2700 DATA248.173.157.128.24.2
 37.143.128.168.200.220.140.1
 1.330.173.169.2000
 2710 DATA248.24.127.165.128.
 168.200.183.141.32.133.88.12
 0.32.128.128.2000
 2720 DATA254.128.173.26.12
 0.200.264.167.128.200.3.78.2
 35.138.32.1820
 2730 DATA258.138.32.318.138.1

73.167.138.200.158.24.237.56
 138.141.11.1820
 2740 DATA258.180.5.177.87.13
 8.140.57.208.200.204.11.128
 208.244.248.2320
 2750 DATA261.136.148.87.88.88
 180.37.133.58.165.58.193.88
 84.288.2480
 2760 DATA262.208.32.238.200.2
 80.200.238.32.208.56.32.50.1
 80.148.0.2170
 2770 DATA268.32.143.87.88.88
 0.143.0.143.248.200.200.201
 32.144.1870
 2780 DATA268.201.128.144.7.201
 1.68.178.3.143.248.130.86.32
 8.32.129.1820
 2790 DATA268.32.38.130.32.53
 138.172.11.138.136.177.57.2
 90.148.87.1820
 2800 DATA268.128.220.248.173
 55.128.140.1.548.87.143.32.
 128.141.25.1870
 2810 DATA268.148.87.88.88.17
 2.287.128.122.24.227.56.128.
 143.11.138.2000
 2820 DATA268.168.1.140.88.131
 1.68.8.127.28.241.25.128.269
 1.140.1880
 2830 DATA268.128.78.173.128.0
 32.123.188.48.241.20.3.268.2
 84.141.1820
 2840 DATA271.3.160.8.178.98.1
 28.140.57.208.241.86.130.68.
 84.204.1480
 27 2000 1
 28 2000 KRM *****

 29 2000 KRM + SCREEN EDITO
 +
 30 2000 KRM + M80 I/O BOOT1
 KRM +
 31 2000 KRM + FOR AUTO-START
 M8000 +
 32 2000 KRM + BY REV18 CRODOR
 1887 +
 33 2000 KRM *****

GEOSPEED



PROGRAM: GSD0

34 10 FORD-STD3000 C100 FORD-STD
 1000000 C10000 FORD3000+14
 1600000 M3000
 35 00 M8000 17840 CTRM3000+1700
 8000 24 LINE7 9800+0001-0107
 00 90 M8011
 36 00 CTRM1 8.18.0.168.56.78.5
 7.78.8.8.8.888.78.138.281.12
 12
 37 00 CTRM2000 8.133.288.188.8.1
 23.253.185.207.133.278.168.8
 1.177.883.2480

38 00 DATA158.203.200.208.248.0
 80.000.238.87.100.200.201.0
 8.177.878.138.2010
 39 70 DATA200.32.218.200.200.200.
 241.0.3.188.200.170.1.5.188.
 1000.1880
 40 00 DATA203.123.5.88.78.8.207.
 208.78.140.48.3.180.180.170.
 71.1520
 41 00 DATA208.188.200.170.6.3.188
 208.171.7.7.208.184.281.20.1
 80.1820
 42 100 DATA211.38.208.7.38.50.52
 78.32.252.208.38.180.208.38.
 88.232.2020
 43 118 DATA218.177.200.188.217.1
 71.18.208.78.147.8.188.2.244
 1.38.208.1880
 44 100 DATA211.38.208.188.188.0
 71.38.208.123.78.188.188.188.
 8.74.127.1200
 45 100 DATA212.4.127.68.257.2
 12.7.167.168.7.167.188.7.248
 0.2500
 46 100 DATA212.8.128.187.188.0.0
 8.127.78.218.167.148.188.187
 188.818.187.2000
 47 100 DATA218.218.000.18.218.1
 888.188.171.78.9.191.88.9.191
 128.9.1880
 48 100 DATA218.77.4.241.127.4.0
 71.127.8.208.8.178.78.218.78
 1.180.1870
 49 100 DATA218.141.188.218.141.
 77.218.171.217.178.171.218.171
 18.148.78.200.2000
 50 100 DATA218.157.71.4.147.88.
 4.147.187.4.188.18.257.71.25
 8.157.1820
 51 100 DATA218.128.127.181.218.0
 88.38.218.127.78.188.218.200
 1.127.127.2500
 52 100 DATA218.5.188.88.200.41.0
 71.127.147.5.188.81.200.41.0
 3.127.1820
 53 010 DATA218.3.200.78.200.41.
 181.167.138.8.188.127.200.4
 150.157.2180
 54 100 DATA218.7.188.188.200.4
 188.127.78.7.188.1.167.87.8
 17.127.1200
 55 100 DATA217.817.187.287.87.17
 157.131.218.197.218.208.167.
 38.218.200.18.2000
 56 248 DATA218.38.38.38.38.38.3
 8.38.38.38.38.38.38.38.38.38.
 1.2020
 57 000 DATA218.00.00.00.00.00.78
 78.73.88.88.50.50.50.50.50.
 870
 58 000 DATA218.38.38.38.38.38.38.
 38.37.88.73.88.88.88.78.88.
 880
 59 000 DATA218.38.38.38.38.38.38.
 38.38.38.38.38.38.38.38.38.
 900
 60 000 DATA218.38.38.38.38.38.38.
 38.38.38.38.38.38.38.38.38.
 910
 61 000 DATA218.38.38.38.38.38.38.
 38.38.38.38.38.38.38.38.38.
 920
 62 000 DATA218.38.38.38.38.38.38.
 38.38.38.38.38.38.38.38.38.
 930
 63 000 DATA218.38.38.38.38.38.38.
 38.38.38.38.38.38.38.38.38.
 940
 64 010 DATA218.80.78.71.87.80.77
 38.78.88.78.77.38.88.88.88.
 880
 65 000 DATA218.77.88.78.78.
 78.81.88.38.38.38.88.88.88.

LISTINGS

70	3000	105,78,30,88,88,30,88,88,88,1207
71	3000	105,78,30,88,88,30,88,88,88,1207
72	3000	105,78,30,88,88,30,88,88,88,1207
73	3000	105,78,30,88,88,30,88,88,88,1207
74	3000	105,78,30,88,88,30,88,88,88,1207
75	3000	105,78,30,88,88,30,88,88,88,1207
76	3000	105,78,30,88,88,30,88,88,88,1207
77	3000	105,78,30,88,88,30,88,88,88,1207
78	3000	105,78,30,88,88,30,88,88,88,1207
79	3000	105,78,30,88,88,30,88,88,88,1207
80	3000	105,78,30,88,88,30,88,88,88,1207
81	3000	105,78,30,88,88,30,88,88,88,1207
82	3000	105,78,30,88,88,30,88,88,88,1207
83	3000	105,78,30,88,88,30,88,88,88,1207
84	3000	105,78,30,88,88,30,88,88,88,1207
85	3000	105,78,30,88,88,30,88,88,88,1207
86	3000	105,78,30,88,88,30,88,88,88,1207
87	3000	105,78,30,88,88,30,88,88,88,1207
88	3000	105,78,30,88,88,30,88,88,88,1207
89	3000	105,78,30,88,88,30,88,88,88,1207
90	3000	105,78,30,88,88,30,88,88,88,1207
91	3000	105,78,30,88,88,30,88,88,88,1207
92	3000	105,78,30,88,88,30,88,88,88,1207
93	3000	105,78,30,88,88,30,88,88,88,1207
94	3000	105,78,30,88,88,30,88,88,88,1207
95	3000	105,78,30,88,88,30,88,88,88,1207
96	3000	105,78,30,88,88,30,88,88,88,1207
97	3000	105,78,30,88,88,30,88,88,88,1207
98	3000	105,78,30,88,88,30,88,88,88,1207
99	3000	105,78,30,88,88,30,88,88,88,1207
100	3000	105,78,30,88,88,30,88,88,88,1207

LISTINGS

86	80200 PL-3	-HEX	PTB(PBL,CO) (D)TS 42340-HEX	CD	82090 IF (D)A(D)P(F)I (D)S THEN
	DEFERRAL (PL)D(DD)		TYPE "STRINGS"		8000-1, 8000 42399
AF	80000 JA-REC(1)C)	-HEX	82000 IF TR-REC(1)C) OR ABO(80	82480 IF (D)S TR(DD)-S
	JUSTIFICATION		FE) (D)D(DD)D(DD) THEN D(10-10)D(1)		82490 P(0)-LEFT(P)P (D)I (P)A:
EA	80040 B(1)	-HEX	82000 IF TR-REC(1)C) THEN D(1)	DE	82490 LEFT(P)D(1)D(1)D(1)D(1)D(1)
	(B)1(C) EXPECTED FOR SOUND		-8000-D(10) 42399	DE	82490 PRINT P(0)-P(0)-" ",P(0)
	NO NUMBER				" ",P(0)-8,RETURN
91	80050 P(0)A(1)P(0)P(1)		82000 IF TR-REC(1)C) OR TR-8	ER	82490
OC	80060 PC-INT(1)D(PL-3) (D)RT(8)		DC(1)C) THEN 82190	R2	82490 HEX --
			80		80000 82490- FROM IN(DD)C)
AA	80070		70	IF	82490
AB	80080		80	FL	82490 P(0)-INT(1)D(1)D(1)D(1)D(1)D(1)
AC	80090		84		P(0)-D(1)D(1)D(1)D(1)D(1)D(1)
AD	80100		9A	82190	
AE	80110			82490	
AG	80120			82490	
AH	80130			82490	
AI	80140			82490	
AJ	80150			82490	
AK	80160			82490	
AL	80170			82490	
AM	80180			82490	
AN	80190			82490	
AO	80200			82490	
AP	80210			82490	
AQ	80220			82490	
AR	80230			82490	
AS	80240			82490	
AT	80250			82490	
AU	80260			82490	
AV	80270			82490	
AW	80280			82490	
AX	80290			82490	
AY	80300			82490	
AZ	80310			82490	
BA	80320			82490	
BB	80330			82490	
BC	80340			82490	
BD	80350			82490	
BE	80360			82490	
BF	80370			82490	
BG	80380			82490	
BH	80390			82490	
BI	80400			82490	
BJ	80410			82490	
BK	80420			82490	
BL	80430			82490	
BM	80440			82490	
BN	80450			82490	
BO	80460			82490	
BP	80470			82490	
BQ	80480			82490	
BR	80490			82490	
BS	80500			82490	
BT	80510			82490	
BU	80520			82490	
BV	80530			82490	
BW	80540			82490	
BX	80550			82490	
BY	80560			82490	
BZ	80570			82490	
CA	80580			82490	
CB	80590			82490	
CC	80600			82490	
CD	80610			82490	
CE	80620			82490	
CF	80630			82490	
CG	80640			82490	
CH	80650			82490	
CI	80660			82490	
CJ	80670			82490	
CK	80680			82490	
CL	80690			82490	
CM	80700			82490	
CN	80710			82490	
CO	80720			82490	
CP	80730			82490	
CQ	80740			82490	
CR	80750			82490	
CS	80760			82490	
CT	80770			82490	
CU	80780			82490	
CV	80790			82490	
CW	80800			82490	
CX	80810			82490	
CY	80820			82490	
CZ	80830			82490	
DA	80840			82490	
DB	80850			82490	
DC	80860			82490	
DD	80870			82490	
DE	80880			82490	
DF	80890			82490	
DF	80900			82490	
DF	80910			82490	
DF	80920			82490	
DF	80930			82490	
DF	80940			82490	
DF	80950			82490	
DF	80960			82490	
DF	80970			82490	
DF	80980			82490	
DF	80990			82490	
DF	81000			82490	
DF	81010			82490	
DF	81020			82490	
DF	81030			82490	
DF	81040			82490	
DF	81050			82490	
DF	81060			82490	
DF	81070			82490	
DF	81080			82490	
DF	81090			82490	
DF	81100			82490	
DF	81110			82490	
DF	81120			82490	
DF	81130			82490	
DF	81140			82490	
DF	81150			82490	
DF	81160			82490	
DF	81170			82490	
DF	81180			82490	
DF	81190			82490	
DF	81200			82490	
DF	81210			82490	
DF	81220			82490	
DF	81230			82490	
DF	81240			82490	
DF	81250			82490	
DF	81260			82490	
DF	81270			82490	
DF	81280			82490	
DF	81290			82490	
DF	81300			82490	
DF	81310			82490	
DF	81320			82490	
DF	81330			82490	
DF	81340			82490	
DF	81350			82490	
DF	81360			82490	
DF	81370			82490	
DF	81380			82490	
DF	81390			82490	
DF	81400			82490	
DF	81410			82490	
DF	81420			82490	
DF	81430			82490	
DF	81440			82490	
DF	81450			82490	
DF	81460			82490	
DF	81470			82490	
DF	81480			82490	
DF	81490			82490	
DF	81500			82490	
DF	81510			82490	
DF	81520			82490	
DF	81530			82490	
DF	81540			82490	
DF	81550			82490	
DF	81560			82490	
DF	81570			82490	
DF	81580			82490	
DF	81590			82490	
DF	81600			82490	
DF	81610			82490	
DF	81620			82490	
DF	81630			82490	
DF	81640			82490	
DF	81650			82490	
DF	81660			82490	
DF	81670			82490	
DF	81680			82490	
DF	81690			82490	
DF	81700			82490	
DF	81710			82490	
DF	81720			82490	
DF	81730			82490	
DF	81740			82490	
DF	81750			82490	
DF	81760			82490	
DF	81770			82490	
DF	81780			82490	
DF	81790			82490	
DF	81800			82490	
DF	81810			82490	
DF	81820			82490	
DF	81830			82490	
DF	81840			82490	
DF	81850			82490	
DF	81860			82490	
DF	81870			82490	
DF	81880			82490	
DF	81890			82490	
DF	81900			82490	
DF	81910			82490	
DF	81920			82490	
DF	81930			82490	
DF	81940			82490	
DF	81950			82490	
DF	81960			82490	
DF	81970			82490	
DF	81980			82490	
DF	81990			82490	
DF	82000			82490	
DF	82010			82490	
DF	82020			82490	
DF	82030			82490	
DF	82040			82490	
DF	82050			82490	
DF	82060			82490	
DF	82070			82490	
DF	82080			82490	
DF	82090			82490	
DF	82100			82490	
DF	82110			82490	
DF	82120			82490	
DF	82130			82490	
DF	82140			82490	
DF	82150			82490	
DF	82160			82490	
DF	82170			82490	
DF	82180			82490	
DF	82190			82490	
DF	82200			82490	
DF	82210			82490	
DF	82220			82490	
DF	82230			82490	
DF	82240			82490	
DF	82250			82490	
DF	82260			82490	
DF	82270			82490	
DF	82280			82490	
DF	82290			82490	
DF	82300			82490	

```

      REM *** - MARGIN
      TO LEFT OF TABLE
      64 100
      70 200 DATA 2
      80 210
      85 210 ROWS ROWS
      REM SET HEADINGS
      AND DEFINING SP,PC
      90 300
      40 240 GE=" " : INPUT PRINTING BE
      GAINED" : OR IF ASCII=ASCII" : B
      THEN OPEN 4:CLOSE 4
      95 250
      34 260
  
```

```

      REM CALCULATE LINE
      2 LOCATED FROM PRE DATA
      10 270 BI=VAL(STR$(I))-50+1:FOR
      I=2 TO 5:PRE=PRE+I:SUM=SUM
      +I:END=END+I
      97 280 NEXT I:BI=BI+END+I
      18 290
      98 300
  
```

```

      REM PRINT HEADERS
      48 310 PRINT SP:BI+I: : : : : : : : : :
      BI+I: : : : : : : : : : : : : : :
      REM TOP LINE
      47 320 PRINT SP:BI+I: : : : : : : : :
      BI+I: : : : : : : : : : : : : :
      REM BLANK FIELD
      96 330 FOR C=BI-50+1 TO BI:PRINT SP:
      PRINT SP
      REM FIRST HEADINGS
      49 340 PRINT SP:BI+I: : : : : : : : :
      BI+I: : : : : : : : : : : : : :
      REM BLANK FIELD
      94 350 FOR L=1 TO 2:PRINT SP:BI
      PRINT BI
      REM END LINE
      78 360 FOR I=1 TO 2:PRINT SP:BI
      NEXT I:FOR J=1 TO 2
  
```

```

      43 370 PRE=PRE+I:BI=BI+I:BI
      NEXT I:PRINT BI
      REM SET OF HEADINGS
      93 380 NEXT:PRINT:NEXT
      46 390 PRINT SP:BI+I: : : : : : : :
      BI+I: : : : : : : : : : : : : :
      REM HEADINGS
      58 400
      78 410
      REM CALCULATIONS
      94 420 FOR B=-3 TO 2:PRINT SP
      PRINT SP
      98 430 : DIAMETER = 10*I
      99 440 : CIRC = PI*(DIAMETER)
      100 450 : VOLUME = PI*(DIAMETER)
      94 460 : PI=PI*DIAMETER*PI*BI+I:
      SUM=SUM+VOLUME:PRINT BI
      31 470 : PI=PI*VOLUME:PI=PI+I:BI
      NEXT BI:PRINT SP
      94 480 : PI=CIRC*PI*BI+I:BI+I
      NEXT BI:PRINT BI
      95 490 NEXT
      97 500 PRINT SP:BI+I: : : : : : : :
      BI+I: : : : : : : : : : : : : :
      REM END OF TABLE LINE
      75 510
      74 520 PRINT:PRINT:PRINT WITH DATA
  
```

```

      LINE=" "
      90 530 PRINT:PRINT DATA " ",FOR B=
      2 TO 2:PRINT BI+I:BI+I:BI:BI
      PRINT BI+I:BI
      99 540 PRINT:PRINT DATA "BI
      900 IF ASCII=ASCII" THEN
      PRINT BI:CLOSE 4:END
      95 550 PRINT:PRINT:END
      96 560
      97 570
      98 580
      99 590
  
```

MAKING GEOS BRITISH



PROGRAM: RUN LN

```

      40 600 FOR I=0 TO 9:PRINT:PRINT I:FOR
      INT (PI*I):CLOSE 1:G
      80 610 PRINT " "
      70 620 PRINT " "
      70 630 PRINT " "
      70 640 PRINT " "
      70 650 PRINT " "
      70 660 PRINT " "
      70 670 PRINT " "
      70 680 PRINT " "
      70 690 PRINT " "
      70 700 PRINT " "
      70 710 PRINT " "
      70 720 PRINT " "
      70 730 PRINT " "
      70 740 PRINT " "
      70 750 PRINT " "
      70 760 PRINT " "
      70 770 PRINT " "
      70 780 PRINT " "
      70 790 PRINT " "
      70 800 PRINT " "
      70 810 PRINT " "
      70 820 PRINT " "
      70 830 PRINT " "
      70 840 PRINT " "
      70 850 PRINT " "
      70 860 PRINT " "
      70 870 PRINT " "
      70 880 PRINT " "
      70 890 PRINT " "
      70 900 PRINT " "
      70 910 PRINT " "
      70 920 PRINT " "
      70 930 PRINT " "
      70 940 PRINT " "
      70 950 PRINT " "
      70 960 PRINT " "
      70 970 PRINT " "
      70 980 PRINT " "
      70 990 PRINT " "
  
```

```

      (ASCII)
      64 900 PRINT "INSTALLING GEOS"
      65 910 PRINT "GEOS"
      66 920 PRINT "GEOS"
      67 930 PRINT "GEOS"
      68 940 PRINT "GEOS"
      69 950 PRINT "GEOS"
      70 960 PRINT "GEOS"
      71 970 PRINT "GEOS"
      72 980 PRINT "GEOS"
      73 990 PRINT "GEOS"
      74 1000 PRINT "GEOS"
      75 1010 PRINT "GEOS"
      76 1020 PRINT "GEOS"
      77 1030 PRINT "GEOS"
      78 1040 PRINT "GEOS"
      79 1050 PRINT "GEOS"
      80 1060 PRINT "GEOS"
      81 1070 PRINT "GEOS"
      82 1080 PRINT "GEOS"
      83 1090 PRINT "GEOS"
      84 1100 PRINT "GEOS"
      85 1110 PRINT "GEOS"
      86 1120 PRINT "GEOS"
      87 1130 PRINT "GEOS"
      88 1140 PRINT "GEOS"
      89 1150 PRINT "GEOS"
      90 1160 PRINT "GEOS"
      91 1170 PRINT "GEOS"
      92 1180 PRINT "GEOS"
      93 1190 PRINT "GEOS"
      94 1200 PRINT "GEOS"
      95 1210 PRINT "GEOS"
      96 1220 PRINT "GEOS"
      97 1230 PRINT "GEOS"
      98 1240 PRINT "GEOS"
      99 1250 PRINT "GEOS"
  
```

PROGRAM: CHECK LN

```

      60 1300 FOR I=0 TO 9:PRINT:PRINT I:FOR
      INT (PI*I):CLOSE 1:G
      61 1310 PRINT " "
      62 1320 PRINT " "
      63 1330 PRINT " "
      64 1340 PRINT " "
      65 1350 PRINT " "
      66 1360 PRINT " "
      67 1370 PRINT " "
      68 1380 PRINT " "
      69 1390 PRINT " "
      70 1400 PRINT " "
      71 1410 PRINT " "
      72 1420 PRINT " "
      73 1430 PRINT " "
      74 1440 PRINT " "
      75 1450 PRINT " "
      76 1460 PRINT " "
      77 1470 PRINT " "
      78 1480 PRINT " "
      79 1490 PRINT " "
      80 1500 PRINT " "
      81 1510 PRINT " "
      82 1520 PRINT " "
      83 1530 PRINT " "
      84 1540 PRINT " "
      85 1550 PRINT " "
      86 1560 PRINT " "
      87 1570 PRINT " "
      88 1580 PRINT " "
      89 1590 PRINT " "
      90 1600 PRINT " "
      91 1610 PRINT " "
      92 1620 PRINT " "
      93 1630 PRINT " "
      94 1640 PRINT " "
      95 1650 PRINT " "
      96 1660 PRINT " "
      97 1670 PRINT " "
      98 1680 PRINT " "
      99 1690 PRINT " "
  
```

LISTINGS

```

29 350 GET#3,14,24+40014+TRM#1
11,1,1,1
30 340 IF <:30 THEN 1+0,0770 30 8
31 350 READ L,B,IF L=300 THEN 4
80
32 370 PRINT#4,"B-P",3,0
33 380 PRINT#3,CHR$(18)
34 390 GOTO 780
35 400 PRINT#1,"02",3,0,ASC(18)
:ASC(18)
36 410 PRINT PRINT TAB#10
: "000 CONNECTING 00000"
37 420 PRINT#4,"01",3,0,ASC(18)
:ASC(18)
38 430 PRINT#4,"B-P",3,0
39 440 B=30:G=30
40 450 GET#3,14,24+50+50+CHR#10
3
41 460 READ L,B,IF L=300 THEN 8
40
42 470 PRINT#4,"B-P",3,0
43 480 PRINT#3,CHR$(18)
44 490 GOTO 460
45 500 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
46 510 FOR I=0 TO 10
47 520 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
48 530 B=30:G=30
49 540 PRINT#4,"B-P",3,0
50 550 GET#3,14,24+50+50+CHR#10
3
51 560 NEXT 2
52 570 READ L,B,IF L=300 THEN 8
30
53 580 PRINT#1,"B-P",3,0
54 590 PRINT#3,CHR$(18)
55 600 GOTO 570
56 610 PRINT#1,"02",3,0,ASC(18)
:ASC(18)
57 620 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
58 630 B=30:G=30
59 640 PRINT#1,"B-P",3,0
60 650 GET#3,14,24+50+50+CHR#10
3
61 660 READ L,B,IF L=300 THEN 2
40
62 670 PRINT#4,"B-P",3,0
63 680 PRINT#3,CHR$(18)
64 690 GOTO 780
70 710 B=30:G=30
71 720 PRINT#4,"B-P",3,0
72 730 GET#3,14,24+50+50+CHR#10
3
73 740 READ L,B,IF L=300 THEN 8
30
74 750 PRINT#4,"B-P",3,0
75 760 PRINT#3,CHR$(18)
76 770 GOTO 780
77 780 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
78 790 FOR I=0 TO 10
79 800 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
81 810 NEXT I
82 820 READ L,B,IF L=300 THEN 8
30
83 830 PRINT#4,"B-P",3,0
84 840 PRINT#3,CHR$(18)
85 850 GOTO 780
86 860 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
87 870 PRINT PRINT TAB#10
: "000 CONNECTING 00000"
88 880 GOTO 840
89 890 PRINT#4,"B-P",3,0
90 900 GET#3,14,24+50+50+CHR#10
3
91 910 READ L,B,IF L=300 THEN 8
30
92 920 PRINT#4,"B-P",3,0
93 930 PRINT#3,CHR$(18)
94 940 GOTO 880
95 950 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
96 960 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
97 970 NEXT I
98 980 PRINT#4,"B-P",3,0
99 990 GET#3,14,24+50+50+CHR#10
3
100 1000 READ L,B,IF L=300 THEN 8
30
101 1010 PRINT#4,"B-P",3,0
102 1020 PRINT#3,CHR$(18)
103 1030 GOTO 980
104 1040 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
105 1050 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
106 1060 NEXT I
107 1070 PRINT#4,"B-P",3,0
108 1080 PRINT#3,CHR$(18)
109 1090 GOTO 1040
110 1100 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
111 1110 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
112 1120 NEXT I
113 1130 PRINT#4,"B-P",3,0
114 1140 PRINT#3,CHR$(18)
115 1150 GOTO 1100
116 1160 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
117 1170 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
118 1180 NEXT I
119 1190 PRINT#4,"B-P",3,0
120 1200 PRINT#3,CHR$(18)
121 1210 GOTO 1160
122 1220 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
123 1230 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
124 1240 NEXT I
125 1250 PRINT#4,"B-P",3,0
126 1260 PRINT#3,CHR$(18)
127 1270 GOTO 1220
128 1280 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
129 1290 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
130 1300 NEXT I
131 1310 PRINT#4,"B-P",3,0
132 1320 PRINT#3,CHR$(18)
133 1330 GOTO 1280
134 1340 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
135 1350 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
136 1360 NEXT I
137 1370 PRINT#4,"B-P",3,0
138 1380 PRINT#3,CHR$(18)
139 1390 GOTO 1340
140 1400 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
141 1410 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
142 1420 NEXT I
143 1430 PRINT#4,"B-P",3,0
144 1440 PRINT#3,CHR$(18)
145 1450 GOTO 1400
146 1460 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
147 1470 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
148 1480 NEXT I
149 1490 PRINT#4,"B-P",3,0
150 1500 PRINT#3,CHR$(18)
151 1510 GOTO 1460
152 1520 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
153 1530 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
154 1540 NEXT I
155 1550 PRINT#4,"B-P",3,0
156 1560 PRINT#3,CHR$(18)
157 1570 GOTO 1520
158 1580 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
159 1590 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
160 1600 NEXT I
161 1610 PRINT#4,"B-P",3,0
162 1620 PRINT#3,CHR$(18)
163 1630 GOTO 1580
164 1640 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
165 1650 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
166 1660 NEXT I
167 1670 PRINT#4,"B-P",3,0
168 1680 PRINT#3,CHR$(18)
169 1690 GOTO 1640
170 1700 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
171 1710 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
172 1720 NEXT I
173 1730 PRINT#4,"B-P",3,0
174 1740 PRINT#3,CHR$(18)
175 1750 GOTO 1700
176 1760 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
177 1770 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
178 1780 NEXT I
179 1790 PRINT#4,"B-P",3,0
180 1800 PRINT#3,CHR$(18)
181 1810 GOTO 1760
182 1820 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
183 1830 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
184 1840 NEXT I
185 1850 PRINT#4,"B-P",3,0
186 1860 PRINT#3,CHR$(18)
187 1870 GOTO 1820
188 1880 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
189 1890 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
190 1900 NEXT I
191 1910 PRINT#4,"B-P",3,0
192 1920 PRINT#3,CHR$(18)
193 1930 GOTO 1880
194 1940 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
195 1950 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
196 1960 NEXT I
197 1970 PRINT#4,"B-P",3,0
198 1980 PRINT#3,CHR$(18)
199 1990 GOTO 1940
200 2000 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
201 2010 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
202 2020 NEXT I
203 2030 PRINT#4,"B-P",3,0
204 2040 PRINT#3,CHR$(18)
205 2050 GOTO 2000
206 2060 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
207 2070 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
208 2080 NEXT I
209 2090 PRINT#4,"B-P",3,0
210 2100 PRINT#3,CHR$(18)
211 2110 GOTO 2060
212 2120 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
213 2130 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
214 2140 NEXT I
215 2150 PRINT#4,"B-P",3,0
216 2160 PRINT#3,CHR$(18)
217 2170 GOTO 2120
218 2180 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
219 2190 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
220 2200 NEXT I
221 2210 PRINT#4,"B-P",3,0
222 2220 PRINT#3,CHR$(18)
223 2230 GOTO 2180
224 2240 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
225 2250 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
226 2260 NEXT I
227 2270 PRINT#4,"B-P",3,0
228 2280 PRINT#3,CHR$(18)
229 2290 GOTO 2240
230 2300 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
231 2310 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
232 2320 NEXT I
233 2330 PRINT#4,"B-P",3,0
234 2340 PRINT#3,CHR$(18)
235 2350 GOTO 2300
236 2360 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
237 2370 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
238 2380 NEXT I
239 2390 PRINT#4,"B-P",3,0
240 2400 PRINT#3,CHR$(18)
241 2410 GOTO 2360
242 2420 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
243 2430 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
244 2440 NEXT I
245 2450 PRINT#4,"B-P",3,0
246 2460 PRINT#3,CHR$(18)
247 2470 GOTO 2420
248 2480 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
249 2490 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
250 2500 NEXT I
251 2510 PRINT#4,"B-P",3,0
252 2520 PRINT#3,CHR$(18)
253 2530 GOTO 2480
254 2540 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
255 2550 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
256 2560 NEXT I
257 2570 PRINT#4,"B-P",3,0
258 2580 PRINT#3,CHR$(18)
259 2590 GOTO 2540
260 2600 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
261 2610 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
262 2620 NEXT I
263 2630 PRINT#4,"B-P",3,0
264 2640 PRINT#3,CHR$(18)
265 2650 GOTO 2600
266 2660 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
267 2670 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
268 2680 NEXT I
269 2690 PRINT#4,"B-P",3,0
270 2700 PRINT#3,CHR$(18)
271 2710 GOTO 2660
272 2720 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
273 2730 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
274 2740 NEXT I
275 2750 PRINT#4,"B-P",3,0
276 2760 PRINT#3,CHR$(18)
277 2770 GOTO 2720
278 2780 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
279 2790 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
280 2800 NEXT I
281 2810 PRINT#4,"B-P",3,0
282 2820 PRINT#3,CHR$(18)
283 2830 GOTO 2780
284 2840 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
285 2850 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
286 2860 NEXT I
287 2870 PRINT#4,"B-P",3,0
288 2880 PRINT#3,CHR$(18)
289 2890 GOTO 2840
290 2900 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
291 2910 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
292 2920 NEXT I
293 2930 PRINT#4,"B-P",3,0
294 2940 PRINT#3,CHR$(18)
295 2950 GOTO 2900
296 2960 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
297 2970 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
298 2980 NEXT I
299 2990 PRINT#4,"B-P",3,0
300 3000 PRINT#3,CHR$(18)
301 3010 GOTO 2960
302 3020 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
303 3030 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
304 3040 NEXT I
305 3050 PRINT#4,"B-P",3,0
306 3060 PRINT#3,CHR$(18)
307 3070 GOTO 3020
308 3080 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
309 3090 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
310 3100 NEXT I
311 3110 PRINT#4,"B-P",3,0
312 3120 PRINT#3,CHR$(18)
313 3130 GOTO 3080
314 3140 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
315 3150 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
316 3160 NEXT I
317 3170 PRINT#4,"B-P",3,0
318 3180 PRINT#3,CHR$(18)
319 3190 GOTO 3140
320 3200 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
321 3210 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
322 3220 NEXT I
323 3230 PRINT#4,"B-P",3,0
324 3240 PRINT#3,CHR$(18)
325 3250 GOTO 3200
326 3260 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
327 3270 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
328 3280 NEXT I
329 3290 PRINT#4,"B-P",3,0
330 3300 PRINT#3,CHR$(18)
331 3310 GOTO 3260
332 3320 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
333 3330 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
334 3340 NEXT I
335 3350 PRINT#4,"B-P",3,0
336 3360 PRINT#3,CHR$(18)
337 3370 GOTO 3320
338 3380 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
339 3390 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
340 3400 NEXT I
341 3410 PRINT#4,"B-P",3,0
342 3420 PRINT#3,CHR$(18)
343 3430 GOTO 3380
344 3440 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
345 3450 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
346 3460 NEXT I
347 3470 PRINT#4,"B-P",3,0
348 3480 PRINT#3,CHR$(18)
349 3490 GOTO 3440
350 3500 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
351 3510 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
352 3520 NEXT I
353 3530 PRINT#4,"B-P",3,0
354 3540 PRINT#3,CHR$(18)
355 3550 GOTO 3500
356 3560 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
357 3570 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
358 3580 NEXT I
359 3590 PRINT#4,"B-P",3,0
360 3600 PRINT#3,CHR$(18)
361 3610 GOTO 3560
362 3620 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
363 3630 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
364 3640 NEXT I
365 3650 PRINT#4,"B-P",3,0
366 3660 PRINT#3,CHR$(18)
367 3670 GOTO 3620
368 3680 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
369 3690 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
370 3700 NEXT I
371 3710 PRINT#4,"B-P",3,0
372 3720 PRINT#3,CHR$(18)
373 3730 GOTO 3680
374 3740 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
375 3750 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
376 3760 NEXT I
377 3770 PRINT#4,"B-P",3,0
378 3780 PRINT#3,CHR$(18)
379 3790 GOTO 3740
380 3800 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
381 3810 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
382 3820 NEXT I
383 3830 PRINT#4,"B-P",3,0
384 3840 PRINT#3,CHR$(18)
385 3850 GOTO 3800
386 3860 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
387 3870 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
388 3880 NEXT I
389 3890 PRINT#4,"B-P",3,0
390 3900 PRINT#3,CHR$(18)
391 3910 GOTO 3860
392 3920 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
393 3930 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
394 3940 NEXT I
395 3950 PRINT#4,"B-P",3,0
396 3960 PRINT#3,CHR$(18)
397 3970 GOTO 3920
398 3980 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
399 3990 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
400 4000 NEXT I
401 4010 PRINT#4,"B-P",3,0
402 4020 PRINT#3,CHR$(18)
403 4030 GOTO 3980
404 4040 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
405 4050 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
406 4060 NEXT I
407 4070 PRINT#4,"B-P",3,0
408 4080 PRINT#3,CHR$(18)
409 4090 GOTO 4040
410 4100 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
411 4110 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
412 4120 NEXT I
413 4130 PRINT#4,"B-P",3,0
414 4140 PRINT#3,CHR$(18)
415 4150 GOTO 4100
416 4160 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
417 4170 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
418 4180 NEXT I
419 4190 PRINT#4,"B-P",3,0
420 4200 PRINT#3,CHR$(18)
421 4210 GOTO 4160
422 4220 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
423 4230 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
424 4240 NEXT I
425 4250 PRINT#4,"B-P",3,0
426 4260 PRINT#3,CHR$(18)
427 4270 GOTO 4220
428 4280 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
429 4290 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
430 4300 NEXT I
431 4310 PRINT#4,"B-P",3,0
432 4320 PRINT#3,CHR$(18)
433 4330 GOTO 4280
434 4340 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
435 4350 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
436 4360 NEXT I
437 4370 PRINT#4,"B-P",3,0
438 4380 PRINT#3,CHR$(18)
439 4390 GOTO 4340
440 4400 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
441 4410 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
442 4420 NEXT I
443 4430 PRINT#4,"B-P",3,0
444 4440 PRINT#3,CHR$(18)
445 4450 GOTO 4400
446 4460 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
447 4470 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
448 4480 NEXT I
449 4490 PRINT#4,"B-P",3,0
450 4500 PRINT#3,CHR$(18)
451 4510 GOTO 4460
452 4520 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
453 4530 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
454 4540 NEXT I
455 4550 PRINT#4,"B-P",3,0
456 4560 PRINT#3,CHR$(18)
457 4570 GOTO 4520
458 4580 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
459 4590 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
460 4600 NEXT I
461 4610 PRINT#4,"B-P",3,0
462 4620 PRINT#3,CHR$(18)
463 4630 GOTO 4580
464 4640 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
465 4650 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
466 4660 NEXT I
467 4670 PRINT#4,"B-P",3,0
468 4680 PRINT#3,CHR$(18)
469 4690 GOTO 4640
470 4700 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
471 4710 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
472 4720 NEXT I
473 4730 PRINT#4,"B-P",3,0
474 4740 PRINT#3,CHR$(18)
475 4750 GOTO 4700
476 4760 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
477 4770 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
478 4780 NEXT I
479 4790 PRINT#4,"B-P",3,0
480 4800 PRINT#3,CHR$(18)
481 4810 GOTO 4760
482 4820 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
483 4830 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
484 4840 NEXT I
485 4850 PRINT#4,"B-P",3,0
486 4860 PRINT#3,CHR$(18)
487 4870 GOTO 4820
488 4880 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
489 4890 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
490 4900 NEXT I
491 4910 PRINT#4,"B-P",3,0
492 4920 PRINT#3,CHR$(18)
493 4930 GOTO 4880
494 4940 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
495 4950 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
496 4960 NEXT I
497 4970 PRINT#4,"B-P",3,0
498 4980 PRINT#3,CHR$(18)
499 4990 GOTO 4940
500 5000 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
501 5010 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
502 5020 NEXT I
503 5030 PRINT#4,"B-P",3,0
504 5040 PRINT#3,CHR$(18)
505 5050 GOTO 5000
506 5060 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
507 5070 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
508 5080 NEXT I
509 5090 PRINT#4,"B-P",3,0
510 5100 PRINT#3,CHR$(18)
511 5110 GOTO 5060
512 5120 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
513 5130 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
514 5140 NEXT I
515 5150 PRINT#4,"B-P",3,0
516 5160 PRINT#3,CHR$(18)
517 5170 GOTO 5120
518 5180 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
519 5190 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
520 5200 NEXT I
521 5210 PRINT#4,"B-P",3,0
522 5220 PRINT#3,CHR$(18)
523 5230 GOTO 5180
524 5240 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
525 5250 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
526 5260 NEXT I
527 5270 PRINT#4,"B-P",3,0
528 5280 PRINT#3,CHR$(18)
529 5290 GOTO 5240
530 5300 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
531 5310 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
532 5320 NEXT I
533 5330 PRINT#4,"B-P",3,0
534 5340 PRINT#3,CHR$(18)
535 5350 GOTO 5300
536 5360 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
537 5370 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
538 5380 NEXT I
539 5390 PRINT#4,"B-P",3,0
540 5400 PRINT#3,CHR$(18)
541 5410 GOTO 5360
542 5420 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
543 5430 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
544 5440 NEXT I
545 5450 PRINT#4,"B-P",3,0
546 5460 PRINT#3,CHR$(18)
547 5470 GOTO 5420
548 5480 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
549 5490 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
550 5500 NEXT I
551 5510 PRINT#4,"B-P",3,0
552 5520 PRINT#3,CHR$(18)
553 5530 GOTO 5480
554 5540 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
555 5550 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
556 5560 NEXT I
557 5570 PRINT#4,"B-P",3,0
558 5580 PRINT#3,CHR$(18)
559 5590 GOTO 5540
560 5600 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
561 5610 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
562 5620 NEXT I
563 5630 PRINT#4,"B-P",3,0
564 5640 PRINT#3,CHR$(18)
565 5650 GOTO 5600
566 5660 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
567 5670 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
568 5680 NEXT I
569 5690 PRINT#4,"B-P",3,0
570 5700 PRINT#3,CHR$(18)
571 5710 GOTO 5660
572 5720 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
573 5730 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
574 5740 NEXT I
575 5750 PRINT#4,"B-P",3,0
576 5760 PRINT#3,CHR$(18)
577 5770 GOTO 5720
578 5780 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
579 5790 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
580 5800 NEXT I
581 5810 PRINT#4,"B-P",3,0
582 5820 PRINT#3,CHR$(18)
583 5830 GOTO 5780
584 5840 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
585 5850 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
586 5860 NEXT I
587 5870 PRINT#4,"B-P",3,0
588 5880 PRINT#3,CHR$(18)
589 5890 GOTO 5840
590 5900 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
591 5910 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
592 5920 NEXT I
593 5930 PRINT#4,"B-P",3,0
594 5940 PRINT#3,CHR$(18)
595 5950 GOTO 5900
596 5960 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
597 5970 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
598 5980 NEXT I
599 5990 PRINT#4,"B-P",3,0
600 6000 PRINT#3,CHR$(18)
601 6010 GOTO 5960
602 6020 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
603 6030 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
604 6040 NEXT I
605 6050 PRINT#4,"B-P",3,0
606 6060 PRINT#3,CHR$(18)
607 6070 GOTO 6020
608 6080 PRINT#4,"02",3,0,ASC(18)
:ASC(18)
609 6090 PRINT#1,"01",3,0,ASC(18)
:ASC(18)
610 6100 NEXT I
611 6110 PRINT#4,"B-P",3,0
612 6120 PRINT#3,CHR$(18)
613 6130 GOTO 6080
61
```

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Bug Finder

We'd like to remind our readers that we run a Bug Finder service.

If you have typed in one of our programs and despite much checking, you still can't get it to run, then send us the following:

Two copies of your program on tape or disk.

A description of your problem. If possible a listing of your work (you may omit this).

A stamped, self-addressed envelope for return of the program to you.

Should any of the above be missing then we will not be able to deal with your query.

We will try to point out where you have made errors and place a corrected copy of the program back on to your tape or disk before we return it to you.

Do not send a program to us as soon as it stops working, please check it several times first.

We do get a large number of queries and so it may take a while for us to deal with yours personally.

Notes: we can only deal with problems relating to programs published in *Your Commodore*.

Program Submissions

Due to the illness of our software evaluator some people may be experiencing a delay in getting to replies regarding submissions. We are trying to clear the backlog of programs as quickly as we can but this is taking some time. This backlog also affects Bug Finders and Lifesavers.

We apologise for the delay and would ask that you would bear with us while the backlog is cleared.

The publication of Lifesavers has also been halted because of this software backlog. We will be bringing you more short programs and tips as soon as we can.

Commodore Where Are You?

At the *Your Commodore* office we are repeatedly asked for the address and telephone number of Commodore U.K. Many people, after referring to their computer manuals, believe them to be based in Corby.

The Commodore plant at Corby was closed down some time ago. Reprinted here you will find the correct address for Commodore U.K.

We suggest that you write this correct address in the front of your computer's manual for future reference.

Commodore's Business Machines, (U.K.),
Commodore House,
The Switchback,
Gardiner Road,
Maidenhead,
Berks SL6 7XA.

At the *Your Commodore* office we receive hundreds of letters from readers every month. We do try and answer each individually but sometimes this is impossible due to pressure of work. If you have written to us and not received a personal reply, we apologise for this but we cannot promise to reply to every item of mail we receive. If you feel that your question or letter really needs an answer, then inclusion of an a.s.c. will guarantee a reply, although this may still take time to arrive.

Puzzle Corner



Now's your chance to put your computer down for a while and give your brain some exercise.

Presented here are a series of puzzles for you to complete.

Send your answers to the *Your Commodore* Editorial address and you stand a chance of winning either a *Your Commodore* magazine binder or a *Your Commodore* disk binder.

The first correct entry to each puzzle drawn out of the hat on Friday 29th April 1988 will win the binder of their choice, please state your preference when entering the competition. Entries should be sent to:
Your Commodore, Puzzle Corner, 1 Golden Square, London W1R 3AB.

1. Your mother has just baked a delicious fruit cake. Can you cut it into eight pieces with just three cuts?
2. How many triangles are there in the diagram?
3. One day adventurer, Grondal the Mad is well known for being one of the greediest people around. How many sticks of butter do you think he can eat on an empty stomach?
4. A *Your Commodore* reader has a nice little corner going selling eggs. One Friday, he sets off for market but on the way, he is stopped by six different people. Each person buys half his eggs plus half an egg. At this stage he is only left one egg left, he turns round and goes home. How many eggs did he start off with?



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2k min.) and Atari 57 (requires 512k, mouse and colour monitor or TV).
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